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UNDERHILL (G. W.). **The Green Stinkbug.**—*Bull. Virginia agric. Exp. Sta.* no. 294, 26 pp., 3 graphs, 6 figs., 11 refs. Blacksburg, Va, February 1934. [Recd. March 1935.]

A further account [*cf. R.A.E.*, A **21** 463] of the bionomics of *Acrosternum hilare*, Say, during 1926–33 in Virginia, where it is spread over 20 counties, commences with general information on its history, food-plants and distribution. Its chief cultivated food-plants are the pods of lima beans [*Phaseolus lunatus*] and peach fruits. The winter is passed in the adult stage under leaves and rubbish in the woods, preferably in well drained areas. During the winter the adults come out and feed when the maximum temperature reaches 65°F. They usually appear on wild plants in the fields about the middle of June, and they are most numerous in the last part of the month and throughout July. Most of them die by mid-August. The peak of oviposition is in the first half of July. A female usually lays 75–80 eggs, in clusters of about 37 deposited at intervals usually of 8–10 days on the leaves, fruit limbs or trunk of the plants. The egg stage lasts from 6·5 to 14·5 days, with an average of 8. The first nymphs hatch about the last week in June and are present in the field until mid-November. They moult five times. Nymphs that hatched in July matured in about 36 days but those that hatch in late August and early September take from 8 to 10 weeks. Young adults reach maturity from the last week in July until November and begin to hibernate in September and October.

High temperature during the summer, drought and heavy rain storms may reduce the numbers of the Pentatomid. Parasites [*loc. cit.*] destroy an average of 16·4–27·2 per cent. of the eggs. *Podisus maculiventris*, Say (*spinosus*, Dall.) and the larvae of *Chrysopa* sp. occasionally attack various stages, and a mite, *Trombidium* sp., was observed feeding upon the eggs.

The nymphs, especially the older ones, are very resistant to contact sprays. Of the many preparations tested, soap solutions (1 lb. to 10 U.S. gals. water) were found to kill the nymphs. Mixtures in which commercial preparations containing pyrethrum or rotenone, of which the latter seemed the more effective, were used with soap solution at the rate of ½ U.S. gal. and 5–6 lb. soap to 100 U.S. gals. spray, gave better results but were rather too expensive. One U.S. gal. spray to 20 hills of bush lima beans is the minimum effective amount. There was no noticeable scorching under field conditions. Dusting with calcium cyanide or derris against the nymphs and spraying and dusting against the eggs and adults were ineffective.

The bush type of lima beans should be cultivated in preference to the pole variety and should be grown at least 100 yards away from such trees as lime [*Tilia americana*] and black locust (*Robinia pseudacacia*), which may serve as food for the bugs. These trees, as well as redbud [*Cercis canadensis*], should be removed from vineyards and orchards, if the bugs are feeding on grapes, peaches, etc. [*cf.* **21** 452]. Hand collection early in the season is of value.

WEBSTER (R. L.). **A Nine Year Study of Codling Moth Trap Records.**—*Proc. Wash. St. hort. Ass.* **30** (1934) pp. 50–51. Pullman, Wash. [1935.]

Notes are given on the activity of the codling moth [*Cydia pomonella*, L.] in each year during 1926–34 in Washington as recorded by traps

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used to determine the proper time at which to apply cover sprays. It is concluded that infestation in any given year depends primarily on the initial population in the orchard, and also on the time, duration and degree of activity of the adults as affected by temperature.

MARSHALL (J.), EIDE (P. M.) & PRIEST (A. E.). **Increasing and Maintaining Lead Arsenate Deposits for Codling Moth Control.**—*Proc. Wash. St. hort. Ass.* **30** (1934) pp. 52–64, 1 ref. Pullman, Wash. [1935.]

In spraying experiments in Washington against the codling moth [*Cydia pomonella*, L.] on apples, 1 U.S. pint of a slow drying herring oil with an iodine content of 128 increased the toxicity of 2 lb. lead arsenate in 100 U.S. gals. water more than a quicker drying sardine oil with an iodine content of 181. One U.S. pint herring oil and 2 lb. lead arsenate gave as good results as 3 lb. lead arsenate alone. The addition of oleic acid to herring oil with a free fatty acid content of 0·6 per cent. (calculated as oleic) improved the coverage of lead arsenate sprays, and the results appeared equally satisfactory whether the oleic acid was used at the rate of 5 or 20 per cent. Oleic acid ($\frac{1}{4}$ U.S. pint) added to 2 lb. lead arsenate produced a uniform but thin coverage and gave inferior control to 3 lb. lead arsenate alone, but when it was saponified with triethanolamine ($\frac{1}{8}$ U.S. pint), heavy flocculation occurred and the deposit was increased. It still remained lighter than that from 1 U.S. pint herring oil but the control was just as good. It caused no arsenical injury in 1934. The effect of soap solutions in breaking down acid lead arsenate depends partly on their hydrogen-ion content. They vary greatly in the formation of soluble arsenic, and those in commercial use appear more likely to cause injury than herring oil. The damage generally becomes more severe as the seasonal humidity increases. Experiments indicate that the effects of herring oil might be improved by adding a little soap.

Kerosene ($\frac{3}{4}$ per cent.) used with 2 lb. lead arsenate and triethanolamine oleate gave satisfactory field results, apparently because the arsenical deposit was heavy; a 2 per cent. concentration of this kerosene had little ovicidal effect. In using kerosene or summer oil with soap and lead arsenate the relative amounts of the constituents is of great importance; the best quantities for 3 lb. lead arsenate at summer temperatures and with soft water appeared to be about 0·5 per cent. kerosene or summer oil (containing approximately 5 per cent. oleic acid) saponified with triethanolamine oleate. Ammonium-caseinate emulsions of kerosene or summer oil used with lead arsenate were less satisfactory than similar oils used with triethanolamine oleate and lead arsenate. Saponification of the oleic acid in the mixtures of summer oil and lead arsenate is probably advisable if it can be accomplished without causing the mixture to break up and is not found to cause excessive arsenical injury. Flocculation of the arsenical generally seems desirable, but alone it cannot be relied upon to produce a satisfactory deposit, for which a particular type of flocculance, requiring the use of both oil and soap, appears necessary. These, however, cannot be recommended without further investigation, unless the damage is serious and other sprays have failed to give satisfactory control.

YOTHERS (M. A.). **Report on the Introduction of *Aphelinus mali* Hald., a Parasite of the Woolly Apple Aphid in the Wenatchee, Washington, District.**—*Proc. Wash. St. hort. Ass.* **30** (1934) pp. 68–71, 1 map. Pullman, Wash. [1935.]

Consignments of *Aphelinus mali*, Hald., were obtained from Ontario and Oregon [*cf. R.A.E.*, A **20** 688] in 1931 for the control of *Eriosoma lanigerum*, Hsm., in view of its association with perennial canker (*Gloeosporium perennans*) [**17** 666]. In July the parasites were introduced into a large cage constructed round a heavily infested apple tree, and their numbers had increased to such an extent within 60 days that 25,500 of their progeny were released, usually in batches of 500 to a tree, in various other orchards in the vicinity of Wenatchee. Hibernating individuals survived temperatures of 31–34°F. in cold storage and a minimum of −10°F. on the caged tree. Further liberations were made in 1932, and in September the cage was opened to allow unrestricted release of all parasites present. During 1931–34, *Aphelinus* became increasingly effective against *Eriosoma* and spread into many new orchards. It has established itself over hundreds of acres and has checked the Aphid successfully in many cases.

OVERLEY (F. L.), OVERHOLSER (E. L.), ST. JOHN (J. L.) & GROVES (K.). **Further Experiments on Spray Residue Removal.**—*Proc. Wash. St. hort. Ass.* **30** (1934) pp. 77–82. Pullman, Wash. [1935.]

Nineteen different commercial washing machines were tested for removing lead arsenate residues from apples in Washington. The following schedules had been used: lead arsenate (3 lb. to 100 U.S. gals. water with $\frac{1}{4}$ lb. soap as a spreader) used as a calyx spray and seven cover sprays; lead arsenate (2 lb. to 100 U.S. gals.) as a calyx spray, followed by six cover sprays at the same rate, but with the addition of 2 U.S. qts. kerosene emulsified with soap; and lead arsenate (3 lb. to 100 U.S. gals.) as a calyx spray followed by two cover sprays, at the same rate, with the addition of $\frac{3}{4}$ U.S. gal. mineral oil emulsified with oleic acid and sodium silicate, and 4 cover sprays at the same rate but with the addition of $\frac{3}{4}$ U.S. pt. fish oil. These programmes controlled the codling moth [*Cydia pomonella*, L.] satisfactorily. It was found impossible in most cases to reduce the residue below the tolerance even with the types of machines employed in the larger packing houses, and it appears that the best washers of the tandem or double wash type are necessary. Vatsol, which was more efficient at 1 per cent. than at $\frac{1}{2}$, improves cleaning with hydrochloric acid or sodium silicate, but in tests when the apples were sometimes dipped for 60–120 seconds, the residue was generally above the tolerance. Where fish oil or oleic acid (5 per cent.) was incorporated in up to 6 cover sprays, the arsenical residue was reduced below the tolerance by using sodium silicate in a brush machine, but when fish oil had been used with lead arsenate in 8–10 sprays, a tandem wash of hydrochloric acid and sodium silicate was necessary. With single washes of fruit sprayed with arsenicals alone, hydrochloric acid removed the lead residue more effectively than sodium silicate, but the latter was better for treating apples sprayed with fish oil and lead arsenate or ones that were rather waxy. Hydrochloric acid is best used in a machine with underneath brushes.

With machines in which the fruit is immersed for a short time in the solution and agitated strongly, the addition of 1–1$\frac{1}{2}$ per cent.

mineral oil will increase the effectiveness of both the sodium silicate and hydrochloric acid washes. It is not effective if fruit that has been sprayed with combinations of fish oil and lead arsenate is washed in a solution of sodium silicate. A warm rinse improves the effectiveness of both washes. Sodium silicate requires a more thorough rinsing. High temperatures in the washing solutions are likely to crack the skin or scald the fruit. Lenticel injury is probably due to arsenical scorching, and in most cases where it was observed the fruit had been sprayed with lead arsenate and soap spreaders.

WEBSTER (R. L.). **Division of Entomology.**—*Bull. Wash. agric. Exp. Sta.* no. 305 (44th Rep.) pp. 34–37. Pullman, Wash., December 1934.

In experiments against the codling moth [*Cydia pomonella*, L.] on apples in Washington [*R.A.E.*, A **23** 274], some combinations of calcium arsenate, even without mineral oils, produced results comparable to those of lead arsenate. Hydrates of zinc and aluminium prepared from the sulphates with the addition of calcium hydrate appear to be satisfactory buffers for calcium arsenate under local conditions [*cf.* **22** 216]. The best amount of sulphate is about 1 lb. used with an excess of lime in 100 U.S. gals. spray. In these mixtures 3 lb. calcium arsenate gave an arsenical deposit and control similar to 3 lb. lead arsenate alone, while 5 lb. gave still better results. The mixtures were improved by adding summer oil, in which case the best rate seems to be not more than $\frac{1}{4}$ lb. metallic sulphate and $\frac{1}{2}$ lb. lime to 100 U.S. gals.

Eriophyes essigi, Hassan, a major pest of blackberries, can be controlled by sprays of lime-sulphur applied at the rate of 7 : 100 in March and 1 : 40 in May [*cf.* **21** 539]. The second application causes the foliage to turn yellow in late summer, and an oil spray may have to be substituted. *Macrosiphum onobrychis*, Boy. (*Illinoia pisi*, Kalt.) was more injurious to peas during the spring and summer of 1934 than it has been since 1918, as the winter had been mild and favourable conditions prevailed during the growing season. *Cydia* (*Laspeyresia*) *nigricana*, Steph. (pea moth) seems to have one annual generation, the adults of which appear in June.

HOLLOWAY (T. E.). **Borer Control by Breeding Sugar Cane for Resistance.**—*Sugar Bull.* **13** no. 11 pp. 3–4, 6. New Orleans, La, 1st March 1935.

The results of tests with 11 varieties of sugar-cane in Louisiana in relation to their resistance to *Diatraea saccharalis*, F., tended to confirm the conclusions reached in British Guiana [*R.A.E.*, A **22** 388]. Tests indicated that there is some relation between hardness of the stalk and final infestation. There are two sorts of resistance, resistance to oviposition and resistance to larval attack, and these may be but are not necessarily concomitant. The percentage of infestation in stalks and joints varied from 37·3 and 4·8, respectively, in the most resistant to 78·1 and 20·6 in the least resistant variety, with the exception of one old type variety not extensively grown, for which the percentages were 93·7 and 22·7. The clusters of eggs were smaller in the resistant varieties. An investigation of the heredity of the different varieties showed that with one exception those now

grown are the results of crosses that produce susceptible plants. All over the world, plants have been bred for resistance rather to disease than to insects, and little attention has been given to resistance in the plants from the entomological standpoint.

Summary for 1934.—*Insect Pest Surv. Bull.* **14** no. 10 pp. 329–347, 8 maps, multigraph. Washington, D.C., U.S. Dep. Agric. Bur. Ent. [1935.]

Maps show the distribution of the more important insect pests in the United States during 1934. The control campaign, possibly assisted by extreme drought and high temperatures, kept the expected infestation of grasshoppers [*cf. R.A.E.*, A **22** 256] in check and reduced autumn oviposition. Infestation was lower, except in Wisconsin and Michigan, than in 1933. A very extensive and severe outbreak of the chinch bug [*Blissus leucopterus*, Say] developed in the maize belt. *Bruchus brachialis*, Fhr. (vetch Bruchid) has spread further in North Carolina [*cf.* **21** 414] and has appeared in Pennsylvania. Suprisingly large numbers of *Eutettix tenella*, Baker (beet leafhopper), which migrated from an unknown breeding area, caused a considerable acreage of beet in Idaho to be abandoned and reduced the crop by 95 per cent. *Phthorimaea* (*Gnorimoschema*) *lycopersicella*, Busck (tomato pinworm) [*cf.* **21** 240] has now been recorded from Missouri, Delaware and Mississippi. Brood VIII of *Tibicen* (*Magicicada*) *septemdecim*, L., appeared in considerable numbers in western Pennsylvania, and there were colonies of brood XX of the 13-year race, *T. septemdecim tredecim*, Riley [*cf.* **22** 256], in Georgia. Since 1933 *Popillia japonica*, Newm., has increased its range by 900 sq. miles, and an established infestation was discovered at St. Louis, Missouri. The distribution of *Scolytus multistriatus*, Marsh., is given.

New and little-known pests found during 1934 included the Coreid, *Phthia picta*, Drury, on tomato in Texas, *Cicadula maidis*, De Long & Wolcott, on maize in California, *Collabismodes cubae*, Boh., which attacked *Capsicum* in Florida in 1931 and 1933, the Bostrychid, *Stephanopachys pacificus*, Csy., which made holes in apples in Washington in September, not having previously been recorded as damaging fruit, the sawfly, *Periclista hicoriae*, Rohw., which was discovered in 1931 attacking pecan along the Mississippi, and in 1934 had become abundant over a considerable area, the Pyralid, *Psara* (*Pachyzancla*) *periusalis*, Wlk., on tomato in greenhouses and tomato and egg-plant [*Solanum melongena*] in fields in Georgia, *Odonaspis penicillata*, Green, on bamboo in Mississippi, and *Parlatoria oleae*, Colv., which was discovered on California privet in Maryland in 1927, on olive, almond, and *Citrus*, etc., in Arizona in 1932 and on olives in California in 1934.

Hassan (A. S.). **Notes on the Eriophyidae of Egypt (Acarina).**—*Bull. Soc. ent. Égypte* **18** fasc. 4 pp. 440–444, 3 figs., 2 refs. Cairo, 1934. [Recd. March 1935.]

The following mites are recorded for the first time from Egypt. *Eriophyes pyri*, Pgst., of which a slight infestation was once found on pears, has probably been introduced in the buds of young imported plants. *E. ficus*, Ewing, was collected on young leaves of edible figs and was abundant throughout the summer, particularly on unhealthy trees. *E. cladophthirus*, Nal., is a serious pest of seedling tomatos, and *Phyllocoptes* sp., attacks the tender foliage of young olive trees.

McMartin (A.). **Locust Research at Experiment Station. Experiments with *Empusa grylli*.**—*S. Afr. Sugar J.* **18** no. 11 pp. 649–651. Durban, 30th November 1934. [Recd. March 1935.]

The author believes that confusion about *Empusa* and *Mucor* attacking locusts has existed for some time. Cultures of what had been thought to be *Empusa grylli* were sent to Kew from South Africa and identified as *Mucor exitiosus*. In laboratory experiments on the cultivation of *Empusa*, the first growth on potato slices repeatedly resembled that of *Empusa* on locusts, but the cultures were later overrun by a growth of bacteria, which was subsequently followed by one of *Mucor*. This started in the centre of the culture and spread outwards over the bacteria, but examination of the underlying potato tissue revealed the presence of unmistakable *Empusa*. Under the microscope the hyphae of *Empusa* look as if they were full of bacteria, and it is tentatively suggested that *Empusa* is really a *Mucor*, growing in association with a possibly parasitic bacterium. *Mucor* probably originates on the food-plants of the locusts and the bacterium may be one of those normally found inside the insect itself; the two may unite within the locust at a certain stage in their biology and continue as an apparently single organism, *Empusa*. It has been established that the *Mucor* is pathogenic, killing locusts in 5–6 days. A liquid medium [*cf. R.A.E.*, A **23** 161] is best for growing cultures, which do well in diluted molasses, sterilised by autoclaving. The insects are infected by being dipped into the culture. Experiments have been undertaken with cultures of fungus from different sources, and two types have proved pathogenic. One consists entirely of yeast-like growth [*cf. loc. cit.*], the other consists of both *Mucor* and the bacterium. Although locusts have been killed by the culture, no *Empusa* has developed as in nature, no external growth having appeared on the dead bodies to render them sources of infection [*cf.* **22** 593].

Wilkinson (D. S.). **On some Braconids (Hym.).**—*Stylops* **4** pt. 3 pp. 71–72, 1 fig. London, 15th March 1935.

This paper contains a description of *Cedria anomala*, sp. n., parasitic on the Pyralid, *Hapalia machaeralis*, Wlk., in Burma, and records of *Apanteles fakhrulhajiae*, Madh. (*rufulus*, Wlkn. [*R.A.E.*, A **18** 635]) associated with lac and probably bred from the Tineid, *Holcocera pulverea*, Meyr., in India, *Ecphylus hylesini*, Ratz., from *Pinus halepensis* attacked by the Scolytid, *Ips* (*Pityogenes*) *quadridens* var. *calcaratus*, Dej., in France, and *Helorimorpha coffeae*, Brues, bred from adults of the Pentatomid, *Antestia lineaticollis*, Stål, in Kenya.

Park (T.). **Studies in Population Physiology. IV. Some Physiological Effects of Conditioned Flour upon *Tribolium confusum* Duval and its Populations.**—*Physiol. Zoöl.* **8** no. 1 pp. 91–115, 1 fig., 17 refs. Chicago, Ill., January 1935.

In continuation of investigations [*R.A.E.*, A **21** 383; **22** 591] on the effect on *Tribolium confusum*, Duv., of the modification it brings about in its environment, experiments were made with unbleached patent flour kept in darkened incubators at about 28°C. [82·4°F.] and 40–50 per cent. relative humidity.

The following is based on the author's summary: Males reared and living in conditioned flour, *i.e.*, flour in which *Tribolium* has produced

modifications, ate only half as many of the eggs as males reared in fresh flour and living in it. Of 50 pupae selected at random from the same stock, half were allowed to develop in conditioned flour and half in fresh flour. The unfertilised females were kept in the same medium in which they had developed. Those in the fresh flour laid three times as many eggs as the ones in conditioned flour. During this experiment there were indications of rhythmic and cyclic variations in fecundity. The eggs of unfertilised females are sterile. In the next experiment, the same method of rearing was adopted, but the females were paired with males reared in the same manner, and the experiment was arranged to prevent cannibalism from falsifying the counts of the eggs. Females in unconditioned flour laid about 9 times as many eggs as those in conditioned flour, but when females were transferred from conditioned flour to the control, their fecundity was raised to about the same standard as that of females reared in fresh flour. When females from fresh flour were mated with males from pupae that had developed in conditioned flour, their fecundity decreased, but females from the conditioned medium could not be rendered more fecund by being mated with males from fresh flour. The viability of the eggs was about the same in both environments, but in the conditioned medium larval development took much longer and was far more variable. The effect of the medium on development was not apparent until the second instar. In conditioned flour larval mortality was very much higher. The pupal stage lasted about the same time in both environments, but manifested far greater variability in the conditioned medium. It therefore appears that the modification of its environment by *Tribolium* living in flour is largely responsible for the invariable reduction in populations, which is probably induced primarily by a decrease in the fecundity of the females and an increase in the larval period and in larval mortality.

Taylor (T. H. C.). **The Campaign against** *Aspidiotus destructor*, **Sign., in Fiji.** (With Three Sections by R. W. Paine.)—*Bull. ent. Res.* **26** pt. 1 pp. 1–102, 1 map, 40 figs., 29 refs. London, March 1935.

A very full account is given of extensive work on the biological control of *Aspidiotus destructor*, Sign., in Fiji, where it attacks over 20 species of plants and causes severe damage to coconut, banana, *Piper methysticum* and avocado. In view of the occurrence of intermediate forms, *A. transparens*, Green, is not considered to be distinct from *A. destructor*. The bionomics of the scale and the causes of its economic importance in Fiji before 1928 are outlined, and notes are given on the extent to which it was controlled by climatic factors and natural enemies before 1927.

The natural enemies studied in Java and Trinidad with a view to their introduction are dealt with in detail, their immature stages and bionomics being described and their importance estimated. Those examined in Java included *Chiloneurinus microphagus*, Mayr, *Aspidiotiphagus citrinus* var. *agilior*, Berl., *Physcus varicornis* var. *intermedia*, Gah., *Scymnus severini*, Wse., *S. apiciflavus*, Mots., *Pharellus minutissimus*, Sic., *Aphytis* (*Aphelinus*) *chrysomphali*, Merc., *Comperiella unifasciata*, Ishii, *Spaniopterus crucifer*, Gah., *Casca parvipennis*, Gah., *Scymnus* sp., and *Aleurodothrips fasciapennis*, Frankl. Of these, the last 6 were introduced into Fiji in 1927, but failed to become established in the field. Those studied in Trinidad were *Cryptognatha nodiceps*, Mshl., *C. simillima*, Sic., *Azya trinitatis*, Mshl., *Microweisia*

(*Pentilia*) *insidiosa*, Muls., and *Scymnus aeneipennis*, Sic., all of which were introduced into Fiji in 1928. The methods of transport, breeding and liberation are described and the factors responsible for the great success of *C. nodiceps* [*cf. R.A.E.*, A **17** 734; **18** 10; **20** 604, etc.] are discussed. The author believes that a predator is more effective than a parasite in the control of such insects as *Aspidiotus*, since a natural enemy of exceptional voracity as well as a high rate of multiplication is required to effect control before the scale population reaches its natural saturation point, and the wandering larvae, which have no room to settle, are liable to be spread to other trees by birds, etc.

PETCH (T.). **Notes on Entomogenous Fungi.**—*Trans. Brit. mycol. Soc.* **19** pt. 3 pp. 161–194, 7 figs. Cambridge, February 1935. **Entomogenous Fungi from Madagascar.**—*Ann. Cryptog. exot.* **6** pp. 230–235. Paris, 1933. [Recd. March 1935.]

The species dealt with in the first paper include: *Stereocrea coccophila*, sp. n., described from a scale insect on *Eugenia* in Ceylon; and *Empusa muscae*, which is recorded on *Lygus pabulinus*, L., in England.

LEVER (R. J. A. W.). **Annual Report of the Government Entomologist for the year 1932/33.**—*Brit. Solomon Is. agric. Gaz.* **2** no. 4 pp. 2–5. Tulagi, October 1934. [Recd. March 1935.]

PAGDEN (H. T.). **Annual Report of the Senior Entomologist for the Year 1933/34.**—*T.c.* pp. 5–9.

These reports, most of the information in which has already been noticed [*cf. R.A.E.*, A **21** 482; **22** 64, 524; **23** 204, etc.], deal briefly with insect pests of the coconut palm in the British Solomon Islands.

Palms bearing heavy crops may carry as many individuals of *Axiagastus cambelli*, Dist., as palms that do not bear. *Tirathaba rufivena*, Wlk., attacked about 10·7 per cent. of the young nuts in one estate, but is not usually so numerous. The palm weevil, *Rhynchophorus schach*, Ol., has been collected on 3 islands and was found chiefly on the ivory-nut palm, *Coelococcus salomonensis*, though one coconut palm was observed to have been killed by it. The most effective control for *Brontispa froggatti*, Sharp [*cf.* **17** 416] is the burning of the infested unopened leaflets. Treatment with a nicotine-soap wash is widely practised but is unsatisfactory.

LEVER (R. J. A. W.). **Further Notes on Local Termites.**—*Brit. Solomon Is. agric. Gaz.* **2** no. 4 pp. 10–13, 13 figs. Tulagi, October 1934. [Recd. March 1935.]

Brief notes and diagrams are given of the forms of *Coptotermes grandiceps*, Snyder (*solomonensis*, Hill) [*cf. R.A.E.*, A **23** 204], a pest of timber in the Solomon Islands, and of *Microcerotermes piliceps*, Snyder, and *Eutermes yandinensis*, Hill, which often make nests on coconut palms, but are usually harmless as they feed on vegetable detritus. *Microcerotermes* sometimes tunnels in and injures the leaf-stalk of young coconut palms, and *Eutermes* occasionally attacks exposed woodwork in the open air.

Lever (R. J. A. W.). **Tortoise-beetle on Tung Trees.**—*Brit. Solomon Is. agric. Gaz.* **2** no. 4 p. 13, 1 fig. Tulagi, October 1934. [Recd. March 1935.]

Brief notes are given on two Cassidid beetles, *Aspidomorpha australasiae* var. *guerini*, Boisd., the more common, and *Metriona* sp., which were observed damaging the leaves of a few tung oil trees (*Aleurites fordi*) on Guadalcanal in August 1934. If they should become a serious pest, the best control would be a spray of lead arsenate (2 lb. to 50 gals. water).

Lever (R. J. A. W.). **Beetle Pests on Taro.**—*Brit. Solomon Is. agric. Gaz.* **2** no. 4 p. 14. Tulagi, October 1934. [Recd. March 1935.]

Serious damage to the rhizomes of taro (*Colocasia*) in the Solomon Islands has recently been caused by the larvae of Dynastids of the genus *Papuana*. The larvae are attacked by Scoliid parasites.

Adamson (N. J.). **Protection of Pear-grafts from the Pear-leaf-curling Midge.**—*N.Z. J. Agric.* **50** no. 1 pp. 43–44, 1 fig. Wellington [N.Z.], 21st January 1935.

Dasyneura (*Perrisia*) *pyri*, Bch., often harms young pear trees and new grafts in New Zealand. New grafts may be completely protected by coverings of muslin. Hoops of wire are fixed to a light batten nailed to the tree-stump, and a muslin bag is drawn over the wire frame and tied at the bottom. Coverings may be left on until about mid-November, when the scions have become well-established and the midge attack has subsided.

Gourlay (E. S.). **Parasites of the Golden Oak Scale. The Establishment in New Zealand of *Habrolepis dalmanni* Westw.**—*N.Z. J. Sci. Tech.* **16** no. 4 pp. 216–235, 9 figs. Wellington, N.Z., January 1935.

The distribution of *Asterolecanium variolosum*, Ratz., is briefly discussed. In New Zealand it is only known to occur on *Quercus robur* (*pedunculata*), to which it causes serious injury, and on an unidentified oak that is possibly a subspecies of it. Some varieties of *Q. robur*, however, are more or less immune. The adults of the Coccid overwinter and produce two broods. The first of these, which consists of females only, appears between the end of September and the end of November, and the second, which consists of both sexes, begins to emerge in February and continues until the end of May in mild localities. Males are seldom seen in flight. The young Coccids crawl actively and in autumn are carried for considerable distances on fallen leaves by wind.

Eight consignments of *Habrolepis dalmanni*, Westw., an Encyrtid parasite of this scale, were imported from Massachusetts during the years 1923–28. Of these the fourth, sent in 1925 [*R.A.E.*, A **14** 421], was the most satisfactory. The boxes containing the parasitised scales were kept during transit in the ship's fruit-room at temperatures near 40°F. On arrival 18 females and 1 male were found to be alive. From these, over 400 parasites were bred in the laboratory and liberated in various localities. The females are parthenogenetic, and the males, which are very seldom observed, play no significant part in the perpetuation of the species [*cf. loc. cit.*]. By 1929 the parasite had become

well established ; and early in 1934, the average percentage of parasitism was 59·63 where it had been established for eight seasons, and 30·72 where it was established two seasons later.

DeLong (D. M.). **Experiments with Sulphur and Pyrethrum.**—*Bull. Crop Prot. Inst.* no. 44, 6 pp. Washington, D.C., March 1934. [Recd. March 1935.]

In experiments in Ohio on the immunity from attack by sucking insects produced in plants by insecticides, sulphur, although it has a far slower toxic action than pyrethrum, killed insects that hatched 1–3 weeks after application, apparently acting in some way through the plant [*R.A.E.*, A **22** 698]. Plants dusted with sulphur appear vigorous and healthy and are free from the stunting and curling produced by leafhoppers (*Empoasca fabae*, Harr.). Under field conditions, combinations of sulphur (300 mesh) and pyrethrum flowers in the proportion of 95 : 5 or 90 : 10 [*cf.* **22** 418], the pyrethrin content of the mixture being about 0·05 and 0·1 per cent., respectively, gave very good results. The most efficient combination, however, was 75 per cent. sulphur and 25 per cent. pyrethrum dust consisting largely of residue and having a pyrethrin content of only 0·05 per cent. The use of another grade of pyrethrum dust, containing 0·5 per cent. pyrethrins, improved the physical properties of the mixture. The sulphur present in these mixtures, especially those with a higher pyrethrin content, will also effectively control red spider [*Tetranychus telarius*, L.] and protect plants to some extent against the bean beetle [*Epilachna corrupta*, Muls.]. The dusts are usually applied at the rate of 30 lb. per acre. The general effects are the same as those that have been produced by spraying potatoes with lime-sulphur against the potato psyllid, *Paratrioza cockerelli*, Šulc [**22** 128].

Dohanian (S. M.). **The European Corn Borer on Long Island.**—*Psyche* **41** no. 4 pp. 214–220, 1 map, 1 ref. Cambridge, Mass., December 1934. [Recd. March 1935.]

Pyrausta nubilalis, Hb., was first discovered on Long Island in 1923, when larvae of the one-generation strain were found at the extreme west. This strain spread eastward at an average rate of 4 miles a year during the following 10 years. Control measures, the comparative scarcity of hibernating quarters owing to the absence of field maize, and the fact that this form rarely attacks weeds, probably account for the slowness of spread. In 1927, the two-generation strain was discovered at the extreme east, from which it spread westwards almost twice as rapidly. The two strains now occur together over an area of about 275 sq. miles to the west of the centre of the Island. Annual surveys of the populations showed that the one-generation strain increased slowly but steadily during 1928–33. During 1931 there was a marked increase of the two-generation strain. A list is given of the 23 plants attacked on Long Island. Maize is the only crop that is affected commercially, but potato is important as a reservoir of infestation, and the insect may be introduced into uninfested areas in the pods of lima beans.

The abundance of the two-generation strain and its practical isolation from neighbouring infested areas presented an excellent opportunity to ascertain the value of biological control. During the summer of 1933,

67,435 individuals of 16 species of introduced parasites, including some of those already noticed [*R.A.E.*, A **16** 273; **22** 114; **23** 247], as well as *Omorgus* (*Campoplex*) *multicinctus*, Grav., *O.* (*C.*) *pyraustae*, Smith, *Phaeogenes nigridens*, Wesm., and *Zenillia mitis*, Mg., were liberated.

OSBORN (H. T.). **Incubation Period of Pea Mosaic in the Aphid** *Macrosiphum pisi*.—*Phytopathology* **25** no. 2 pp. 160–177, 2 figs., 19 refs. Lancaster, Pa, February 1935.

The detailed results are given of experiments in the United States that demonstrated an incubation period of pea mosaic in *Macrosiphum onobrychis*, Boy. (*pisi*, Kalt.) [*cf. R.A.E.*, A **22** 131]. The disease was transmitted by the Aphid from broad beans to peas, sweet peas [*Lathyrus odoratus*] and crimson clover [*Trifolium incarnatum*], and back from these to beans. In the incubation experiments, which were made on broad beans only, colonies of 50–200 immature Aphids (except in one instance in which adults were used) were allowed to feed on diseased plants for 2–12 hours and were then transferred to healthy ones. In tests with 23 colonies the Aphid did not infect healthy plants immediately after feeding on diseased ones. For 20 of the colonies the extrinsic incubation period varied from 9–15 to 21–48 hours. In one colony 72–96 hours were required. In 2 colonies kept at 80–90°F. the period was 4–10 hours. Tests with other Aphids showed that *M. solanifolii*, Ashm. (*gei*, auct.) transmitted the disease [**23** 166], but that *Aphis rumicis*, L., did not.

WELLMAN (F. L.). **Dissemination of Southern Celery-Mosaic Virus on Vegetable Crops in Florida.**—*Phytopathology* **25** no. 3 pp. 289–308, 6 figs., 14 refs. Lancaster, Pa, March 1935.

The following is taken from the author's summary. The virus of southern celery mosaic (celery virus 1) in Florida [*cf. R.A.E.*, A **22** 132, 569, etc.] is spread to some extent by mechanical means, but any large increases in the numbers of diseased celery plants was observed to depend on the occurrence of great numbers of the Aphid vector, *Aphis gossypii*, Glov. Dissemination of the disease in the field depended largely on the movement of infected Aphids. The spread was most rapid and extensive on squash, but was somewhat less so on pepper (*Capsicum*), as the plants were set some distance apart. In fields of celery, which is more densely planted, the spread was less rapid because of the excessive amount of foliage available to the Aphids.

[**Insect Pests in New Mexico in 1933–34.**]—*Rep. New Mexico agric. Exp. Sta.* **45** (1933–34) pp. 36–42, 4 figs. State College, N.M. [1935.]

Data on means of attracting the codling moth [*Cydia pomonella*, L.] [*cf. R.A.E.*, A **22** 320, 576; etc.] indicate that a mercury arc-lamp giving light rich in ultra-violet rays is more attractive than a Mazda incandescent lamp and that a cane syrup bait increases the attractiveness of either light. It appears that psyllid yellows of potatoes is a condition caused by the feeding of the potato Psyllid [*Paratrioza cockerelli*, Šulc], which results in the degeneration of the chloroplast

and the alteration of the carbohydrate metabolism. Sprays of lime-sulphur gave better control than combinations of oil and nicotine, but the use of nicotine is necessary against the western potato leafhopper [? *Empoasca abrupta*, DeLong]. Damage was caused to about 110,500 acres of forage and other crops by grasshoppers, the most injurious being *Melanoplus bivittatus*, Say, *M. differentialis*, Thomas, *M. femur-rubrum*, DeG., and *Camnula pellucida*, Scud. About 100 larvae of *Prionus californicus*, Mots. (giant apple root borer), caged in groups of 10 in artificial shelters [*cf.* **21** 450], were buried in trenches 2 ft. deep during the autumn and winter and were treated in spring at a soil temperature of 45–51°F. with insecticides used with certain solvents or emulsifiers. Complete control was obtained with paradichlorobenzene applied at the rate of 3¼ oz. in 1 U.S. pint petrol per cu. ft. and with potassium sulphocarbonate at the rate of 1 oz. in 1 U.S. gal. water per cu. ft. An emulsion of 1 oz. tetrachlorethane and 2 oz. soap in 1 U.S. gal. water per cu. ft. killed 70 per cent. of the larvae. Application of such soil insecticides should be made in spring, as soon as the soil temperature reaches 50°F., and should be stopped before late summer when high temperatures and the ceasing of irrigation during harvest might cause them to injure apple trees.

W[ATSON] (J. R.). **Effect of a Freeze on some *Citrus* Insects.**—*Florida Ent.* **18** no. 4 p. 54. Gainesville, Fla, March 1935.

Investigations in Florida on the effect of unusually low temperatures on 12th and 13th December 1934 on Coccids, showed that only 2 per cent. of *Chrysomphalus ficus*, Ashm. (*aonidum*, auct.) survived a minimum of 16°F. at Gainesville, and these were on such trees as camphor [*Cinnamomum camphora*], where the canopy of leaves or a sheltered position protected them. At Vero Beach, no living individuals of this species were found after a minimum of 26°F. on grapefruits still hanging on trees partly defoliated by the cold and about 80 per cent. of *Lepidosaphes beckii*, Neum., were dead. Those that escaped were in protected places. Many of the eggs of *Lepidosaphes*, however, survived when the parents themselves had died and even when other eggs near the outside of the scale were killed. About 75 per cent. mortality of *Chrysomphalus* occurred on higher ground at Vero Beach where there was little defoliation. All adults and larvae of *Icerya purchasi*, Mask., on tung oil trees [*Aleurites fordi*] near Gainesville were killed but most of the eggs survived.

DUSTAN (A. G.). **Some new Facts concerning Gladiolus Thrips Control.** —*Quart. Canad. Gladiolus Soc.* Oct. 1934 pp. 13–17, 3 figs. Guelph, Ont., 1934. [Recd. March 1935.]

Most of this information on the control of the gladiolus thrips [*Taeniothrips gladioli*, Mlt. & Stnw.] in Ontario has already been noticed [*cf. R.A.E.*, A **21** 479, etc.]. The treatment of corms with mercury bichloride [*loc. cit.*] can be effectively applied to unpeeled corms if they are immersed for 20 hours. For use on the growing plants, no control has yet been found to be superior to the spray containing Paris green and brown sugar. The injury that it causes to the lower leaves has been reduced, without affecting its insecticidal efficiency, by halving the concentration of Paris green [*cf.* **21** 466], the revised formula being one tablespoonful to 2 lb. brown sugar and 3 gals. water.

The scorching was increased when molasses, honey or white (cane) sugar were substituted for the brown sugar. It was reduced when 2 tablespoonfuls hydrated lime were added to the formula, or when lead arsenate was substituted for the Paris green, but these sprays have not been tested on the thrips.

Downes (W.). **Recent Trials of Repellents for Narcissus Fly.**—*Canad. Ent.* **67** no. 2 pp. 21–24. Orillia, February 1935.

Between 30th May and 22nd June 1933, single applications of repellents were made on plots of narcissus in British Columbia where *Merodon equestris*, F., was exceptionally abundant.

Emergence of the adults began in mid-May, reached a maximum in mid-June, following a sudden rise in temperature, and then decreased rapidly until it ceased at the end of the month. The bulbs were dug in mid-July and left to dry for 10–14 days before the roots were removed and the basal plate was cleaned. Cleaning with a stiff brush shows the entrance holes of the larvae better than scraping with a knife [*cf. R.A.E.*, A **16** 107]. Most of the larvae were small and had only penetrated a little way into the bulbs. It seemed from the condition of the bulbs, however, that some larger ones had survived from the previous year [*cf.* **16** 517]. They were found chiefly in the outer scales or in a side bulb, and the bases of the bulbs were severely damaged.

A mixture of crude naphthalene and powdered coke (applied as late as 15th June) protected 91·2 per cent. of the bulbs, but caused severe scorching. On plots treated with ialine, applied as a dust to the base of the plants at the rate of 1 oz. to 10 lb. lime or as a spray at the rate of 2 oz. to 1 pint summer oil emulsion and 32 pints water, 15·7 and 13·7 per cent. of the bulbs were infested, respectively. Heavy applications of hydrated lime to the base of the plants protected 82·6 per cent. This appears to be the most practical material as it is harmless, readily obtainable and easily applied. Sodium fluosilicate caused scorching when used alone as a dust (20 per cent. filler) or when piled along the rows against the stems at the rate of 1 lb. to 1 bushel fir sawdust. The sawdust applied alone in the same way gave good results, which might have been better if the date of application (16th June) had been earlier. On the untreated plots, 58·4 per cent. of the bulbs were infested. The adults oviposit for preference in bright sunshine and dislike any sort of cover. Egg-laying was little reduced by shading the beds with muslin on a frame 18 ins. high, but it is possible that the partly covered sides may have shut in flies that emerged from bulbs under the covers and compelled them to oviposit there.

Pickett (A. D.). **Some Observations on an Outbreak of the Two-striped Grasshopper** (*Melanoplus bivittatus* **Say**) **in Nova Scotia.**—*Canad. Ent.* **67** no. 2 pp. 24–27, 3 refs. Orillia, February 1935.

During 1931–33 two unrelated local outbreaks of *Melanoplus bivittatus*, Say, caused severe damage to hay, cereals, potatoes and root crops in the dyked lands along the Avon River and at Grand Pré, Nova Scotia, and in 1932 another outbreak appeared on the dyked lands at Canard about 3 miles from Grand Pré. Indifferent results were obtained with poison bran baits, which never destroyed more than half the hoppers, probably because there was plenty of food for them.

Empusa grylli was noticed on the Avon dyked lands in July 1932, and several thousand live grasshoppers, collected by sweeping in places where most of the dead ones were found, were transferred to the Grand Pré area. The weather was rainy and the humidity high, and the fungus spread rapidly. Within about a month it had reduced the infestation by 50–90 per cent. in some places. Further introductions were also made to Canard, but as the conditions were less favourable, dead grasshoppers were not found for 3 weeks and never became so numerous as in the other two districts. In autumn there were comparatively few eggs in the Avon area, but there were many in localised areas at Grand Pré, where the grasshoppers had apparently moved from places in which the fungus had been most prevalent, and at Canard. In 1933, hoppers were abundant by 1st June at Grand Pré, but the disease was not observed until they reached the third instar. It was most prevalent among the young adults. By 15th August not more than 20–25 per cent. of the grasshoppers were left.

At Canard the fungus apparently failed to survive the winter, and several attempts to introduce it from Grand Pré failed, possibly because the weather was dry. The hoppers apparently developed normally and caused considerable damage. Many adults, however, were parasitised by *Agamermis decaudata* [*cf. R.A.E.*, A **11** 361]. Individuals collected at random on 18th August contained an average of 5·5 worms. They were mostly confined to the abdominal region. There was practically no development of eggs in grasshoppers containing more than 2 worms and in many cases the ovaries and testes appeared to have more or less disintegrated.

At Grand Pré parasitism by Mermithids was not so heavy, though about half the living grasshoppers were infested on 1st September, and one contained 34 individuals. The number of eggs in the few egg-pods found in the autumn was considerably below the average. Only 11 egg-pods were discovered in 300 examinations, each of 1 sq. ft. of earth, at Grand Pré, none in 170 at Canard and one in 80 in the Avon area. It appears that *Empusa* and *Agamermis* were almost entirely responsible for this reduction.

HERFS (A.). **Ueber den Teppichkäfer und seine Bekämpfung.** [On the Carpet Beetle and its Control.]—*Mitt. Ges. Vorratsschutz* **11** no. 2 pp. 19–23, 6 figs. Berlin, March 1935.

Since 1930 *Anthrenus verbasci*, L., and *A. scrophulariae*, L., have increased considerably as pests of woollen goods in Germany, particularly where central heating ensures a uniform temperature throughout the year. Valuable articles may be fumigated with Areginal, and materials impregnated with Eulan are proof against species of *Anthrenus* and *Attagenus*.

ZACHER (F.). **Mottenschaden an Kakao, Pralinen und anderen Süsswaren.** [Moth Injury to Cacao, Pralines and other Confectionery.] —*Mitt. Ges. Vorratsschutz* **11** no. 2 pp. 24–25. Berlin, March 1935.

During 1934 most of the moths in samples of infested confectionery, especially nut-chocolate, received from various German firms, were, in order of abundance, *Plodia interpunctella*, Hb., *Ephestia kühniella*, Zell., and *E. elutella*, Hb., which last is usually regarded as the chief pest of

such goods in various parts of the world. In view of this finding, it appears to be more important to prevent the introduction into confectionery factories of *P. interpunctella* than of *E. elutella*. Raw cacao is infested by the latter, but not by the former, which is chiefly a pest of all kinds of nuts and dried fruit.

Silvela Tordesillas (F.). **Trigo con lesiones producidos por el hemíptero *Aelia rostrata* L. " versus " granos normales.** [Wheat injured by *A. rostrata* compared with undamaged Grains.]—*Bol. Inst. Investig. agron.* **1** no. 1 pp. 253–281, 3 figs., 2 graphs, 1 plan. Madrid, January 1935.

The Pentatomid, *Aelia rostrata*, Boh., is a common pest of wheat in Spain and reduces the quality of the grain. The extent of this reduction was investigated both for grains shrivelled as a result of infestation and for those merely punctured. The weight of wheat for a given volume proved a satisfactory indication of quality. The weights in kilograms per hectolitre were 68·5 for shrivelled, 75·08 for punctured, and 78·81 for uninjured wheat. Loss of weight was due to the injured grains being less dense as well as to the vacant spaces between shrivelled grains. The reduction in gluten content [*cf. R.A.E.*, A **22** 332; **23** 119] was 2·39 per cent. in punctured and almost 100 per cent. in shrivelled grain. In respect of quality for seed, uninjured grains planted at depths of 2–4 inches all germinated, but up to 13·5 per cent. of the punctured grains and up to 16 per cent. of the shrivelled ones failed to do so. Plants from uninjured seed tillered better and yielded more grain, but showed no superiority in the proportion of grain to straw, or to any significant extent, in the quality of the grain produced.

Del Giudice (E.). **Secondo contributo alla conoscenza di un Tisanottero parassita del frumento, nuovo per l'Italia (*Haplothrips tritici*, Kurdjumov).** [A Second Contribution to the Knowledge of a Thysanopterous Pest of Wheat new to Italy, *H. tritici*.]—*Pubbl. Staz. sper. Granic. Sicilia* no. 6, 11 pp., 3 pls. Catania, January 1935.

The thrips infesting wheat in Sicily [*R.A.E.*, A **22** 227] has been identified as *Haplothrips tritici*, Kurdj. A detailed description of it is translated from Priesner's monograph [**16** 372].

In 1933 and 1934 the adults appeared on wheat in the second half of April, on the last, still ensheathed, leaf or, more often, on the young, ensheathed ear, and caused deformation of the leaves. Early in May the eggs were laid, either singly or in groups up to five, on the glumes, preferably on the hairy basal portion. They hatched about mid-May. As many as 10 larvae were observed in an ear in 1932, but there were less in 1933 and 1934. The first and second instar larvae fed in the flowers and caused the ears to wither. When the ears reached maturity, the larvae migrated to the ground among the stubble. Second instar larvae and a few pupae were found among the stubble in August, September and October, showing that in Sicily hibernation occurs in the pupal as well as the larval stage. The thrips was also found on oats and various grasses, but not on barley. The losses caused have not been serious, and this may be explained by the fact that stubble is generally burned in Sicily.

Möbius (K.). **Neue Untersuchungen über den Kiefernspinner** (*Dendrolimus pini* **L.**). [New Investigations on the Pine Lasiocampid, *D. pini*.]—*Anz. Schädlingsk.* **11** nos. 2–3 pp. 23–24, 29–33, 2 graphs. Berlin, February–March 1935.

The following is largely taken from the author's summary of observations during an outbreak of *Dendrolimus pini*, L., on pines in Prussia in 1933. A comparison of sample counts of larvae in their winter quarters with counts in spring on trunks banded with adhesive, subject to allowance for disturbing factors, showed that the winter samples represented approximately 50 per cent. of the larvae actually ascending the trunks. The curves of air and ground temperatures were similar to the curve of larval abundance; if the ground temperature rose above 5–6°C. [41–42·8°F.] there was a general ascent of the trunks by the larvae. The larvae did not wander away from banded trunks to seek unbanded ones. Various substitutes for the usual banding material were tried, but none proved satisfactory.

It was established that the moths did not fly from a focus of infestation to adjoining stands. Observations in all areas where adhesive bands were used showed that 97·5 per cent. of the larvae were prevented from ascending the trees. The collapse of the outbreak in seriously infested stands where bands were not applied appeared to be due to bacterial disease.

Bodnár (J.). **Ueber die Aenderung des Nikotingehaltes von Nikotinspritzbrühen bei Aufbewahrung.** [On the Change in Nicotine Content in stored Nicotine Sprays.]—*Anz. Schädlingsk.* **11** no. 3 pp. 27–29. Berlin, March 1935.

It is generally believed that a nicotine spray prepared for use and then kept for 24 hours may become ineffective owing to evaporation of the nicotine, but the author's experiments show that this is not the case. The tests were made with nicotine in water alone or containing 1 per cent. potash soap or Bordeaux mixture, and with two proprietary preparations of nicotine. The sprays contained 0·1 per cent. nicotine. Half of each was kept in a corked bottle and the other half was put in a vessel loosely covered with paper or board. In the bottles the sprays remained unaltered for the entire test period of 30 days. In the vessels they did so for 3–4 days, and even after standing for 10 days they still contained 0·09 per cent. nicotine. These laboratory results were confirmed when the sprays were prepared on a large scale.

Peus (F.). **Der Universal-Fänger "808," eine neue Schabenfalle.** [A new Cockroach Trap, the Universal "808."]—*Z. Gesundh-Tech. Städtehyg* **27** no. 2–3 pp. 75–82, 1 fig. Berlin, 1935.

This new trap is a circular dish of white glazed earthenware. The edge forms an acute angle with the base, and the lip is rounded and overhangs the bottom. The side is hollow, and there is a hole on the outside. A wick passing through the hole from this cavity, which is filled with water, keeps moist a belt of rough fabric placed round the dish. To supplement the attraction of the moisture, a special preparation, smelling of smoked fish, is placed in the middle of the dish. The attractiveness of the trap is further increased by darkness provided by a cover that leaves only enough space at the edge of the dish to let the

cockroaches in. They are kept in by the overhanging lip and by the action of a " crippling powder " placed around the bait. The trap is made in two sizes, one for *Blattella* (*Phyllodromia*) *germanica*, L., and *Blatta orientalis*, L., and the other for the larger *Periplaneta americana*, L. An account of experiments demonstrating its effectiveness is given.

REICHERT (A.). **Rosenschädlinge.** [Rose Pests.]—*Kranke Pflanze* **12** no. 4 pp. 58–61, 1 pl. Dresden, April 1935.

Notes are given on the bionomics of *Malacosoma neustria*, L., and *Nepticula centifoliella*, Zell., on roses in Germany. The larvae of the former, which hatched at the end of April, fed on the leaf-buds and stripped several branches when they were abundant. They were also observed on *Ribes alpinum*, which has not previously been recorded as a food-plant. They pupated at the end of May or in June, and the adults emerged in July or early August. The egg-masses should be collected and the larvae crushed while they are still gregarious. *N. centifoliella* oviposited on the underside of the leaves. When several larvae were present, their mines deformed the leaves. They may be crushed in their mines, or if treatment on a large scale is necessary, an arsenical spray or dust may be applied.

HELM (A.). **Die gewöhnliche Schildlaus an Stachel- und Johannisbeeren.** [The Common Scale on Gooseberry and Currant.]—*Kranke Pflanze* **12** no. 4 pp. 61–63. Dresden, April 1935.

Spraying with tar distillate is recommended against *Lecanium* (*Eulecanium*) *corni*, Bch., on gooseberries and currants in Germany. The bushes should also be thinned out regularly. The author saw young scales grouped on or near the buds just before they sprouted. Shortly afterwards nearly all the scales were found on the leaves. At this time sprays of pyrethrum or of quassia and soft soap killed all those with which they came in contact.

VAYSSIÈRE (P.). **Sur deux insectes récemment introduits en France.**—*Bull. Soc. ent. Fr.* **40** no. 3 pp. 43–44, 2 refs. Paris, 1935.

One adult of *Anaemerus fuscus*, Ol., was found in December 1934 among a sample of *Tephrosia leptostachya* six months after it had been despatched in a box from French West Africa to France. The weevil probably survived the long journey in the pupal stage.

Lily bulbs imported into France in January 1935 from Japan were found to be infested with *Paratrechina flavipes*, Smith. Each bulb contained a small swarm of alate and apterous individuals of this ant, which seemed to be feeding and hollowing out small excavations at the base of the scales.

VINAS (J.). **Les vers de la vigne et les poudrages au fluosilicate de baryum en 1934.**—*C. R. Acad. Agric. Fr.* **21** no. 12 pp. 507–513. Paris, 1935.

In several localities in France, vines were treated with dusts containing 10 and 20 per cent. barium fluosilicate against the overwintered larvae of *Sparganothis pilleriana*, Schiff., and with dusts containing 10 per cent. against the third generation of *Polychrosis*

botrana, Schiff., after heavy damage by the second generation. The author concludes from the results that the slightly greater efficiency of the 20 per cent. dust did not justify its cost. Single applications of the weaker dust appeared to give about 60 per cent. control of *Sparganothis* and nearly 70 per cent. control of *Polychrosis*. In the case of the former, a second application within about 10 days would probably be desirable, since emergence from hibernation often occurs over a long period. Dusting with barium fluosilicate is the only measure allowable against the last generation of *Polychrosis*. One application should be made 4–5 days after the flight of the adults and another after a further 8 days. The state of the vegetation makes it difficult to reach the second generation [*cf. R.A.E.*, A **20** 454]. The dusts should be applied in the form of a fine cloud when the weather is dry and, to avoid injury to the foliage, some time after the application of Bordeaux mixture.

Poisson (R.) & Patay (R.). *Beauveria doryphorae* **n. sp., muscardine parasite du Doryphore :** *Leptinotarsa decemlineata* **Say (Coléoptère chrysomélide).**—*C. R. Acad. Sci. Fr.* **200** no. 11 pp. 961–963, 7 refs. Paris, 1935.

While breeding *Leptinotarsa decemlineata*, Say, from material collected near Rennes, the authors isolated from dead adults a new muscardine fungus, here described as *Beauveria doryphorae*. The insects had a chalky-white appearance, and the body, except for the digestive tract, was filled with mycelium. The disease spread rapidly among pupae and adults, and larvae died 4 days after being exposed to infection, but the eggs seemed to be immune.

Vanwijngaerden (G.). **Notes sur le** *Stethorus punctilium*, **ennemi naturel de l'araignée rouge.**—*Agricultura* **37** no. 4 pp. 296–304, 8 figs., 8 refs. Louvain, November 1934. (With a Summary in Flemish.) [Recd. April 1935.]

Tetranychus telarius, L., is one of the chief pests of grape-vines under glass in Belgium. The larvae and adults of the Coccinellid, *Stethorus punctillum*, Wse., were observed to be predacious on it [*cf. R.A.E.*, A **19** 729]. The larva, pupa and adult are described. The larval stage lasted 10–20 days. In the hot-houses *Stethorus* disappeared when the temperature was allowed to fall after the grapes were picked. It probably hibernates in the adult stage until the temperature is raised in the following year.

Massee (A. M.). **On the Transmission of the Strawberry Virus " Yellow-edge " Disease by the Strawberry Aphis, together with Notes on the Strawberry Tarsonemid Mite.**—*J. Pomol.* **13** no. 1 pp. 39–53, 3 pls., 1 plan, 11 refs. London, March 1935.

This paper records two sets of experiments designed to discover whether *Tarsonemus pallidus*, Banks (*fragariae*, Zimm.) [*cf. R.A.E.*, A **22** 581, etc.] and *Capitophorus potentillae*, Wlk. (*fragariae*, Theo.) [*cf.* **16** 408 ; **21** 296 ; **22** 188] transmit the " yellow-edge " disease of strawberry. Plants used in the experiment begun at East Malling, Kent, in 1932 were freed from all infestation by immersion in hot water

[*cf.* **22** 581]. They were artificially infested with Aphids or mites at intervals during July and August 1933. At the end of September all the plants were once more treated with hot water, and their growth was watched during the following year. Before they were disinfested, two of the plants to which mites had been transferred from diseased plants, and one of those on which mites from healthy plants had been placed, showed symptoms that suggested the virus disease, but since these symptoms did not appear during 1934, they were evidently the result of heavy infestation by mites. It is impossible to diagnose virus on plants badly infested with mites. Three plants infested with Aphids from healthy plants and four infested with Aphids from diseased plants also showed symptoms resembling virus, and continued to display them during the following year. One control plant, which had shown typical symptoms of the virus before September, also failed to lose them after being disinfested.

In the second experiment, plants that had been used in a grafting experiment [**21** 296] and were known to be free from the virus were treated with hot water in the autumn of 1932 and laid down for the propagation of runners. In October 1933 runners from these plants were treated with hot water and placed in pots, which were put in the soil in six bays, each consisting of 30 plants. The two bays in the middle were used as controls. One bay was infested with mites from healthy plants and one with mites from diseased plants. The remaining bays were infested in a similar manner, but with Aphids. The bay containing plants infected with Aphids from diseased plants was shut off by a glass screen. The mites and Aphids for the inoculations were bred on plants of the same clone from which the plants for the experimental plots had been obtained, and some were transferred to diseased plants that had been used in the above-mentioned grafting experiments. At weekly intervals from 5th June to 21st July 5 Aphids and 5 mites were transferred to each of the plants in their respective plots. They were placed on the lower surface of the leaflets near the crowns. The plants were kept free from runners, except that one strong runner from each was put in a pot and placed next to its parent. The runners were infested by migration from the parent plant.

At the end of July all the plants with mites on them showed similar signs of stunting and ill-health, and the infestation was more severe when the mites came from healthy plants. They had no symptoms of disease, even in the autumn when these are usually more obvious and the damage caused by mites is less pronounced. By the first week in September, infestation was less severe, and some of the plants were beginning to make new growth. Although the damage caused by the mites remained apparent, there was no sign of the virus either on the plants or their runners.

At the end of July the leaves of plants infested with Aphids from healthy plants were twisted and curled, but the plants were nearly as tall as the normal ones on the controls. Those infested with Aphids from diseased plants, however, were abnormal on 26th July and by 30th July they showed symptoms of the characteristic " yellow-edge." These plants were not nearly so tall as the controls, and the runners were particularly flattened. By the first week of September, the plants still retained their flattened appearance and the yellowing of the foliage was very pronounced. There were no signs of recovery. Symptoms of the disease were observed on one of the plants among those infested with Aphids from healthy plants. It was at the end of the row next

to the bay infested with Aphids from diseased plants, and it is thought that some Aphids may have strayed round the glass screen.

All the plants in the controls remained healthy throughout the experiment.

Although the first experiment did not give positive results, the author considers that the second experiment, which was made under much more thoroughly controlled conditions, is sufficient to show that *C. potentillae* is the vector of " yellow-edge."

Uchida (T.). **Einige Ichneumoniden-Arten aus China (II).** [Some Chinese Ichneumonids (II).]—*Insecta matsum.* **9** no. 3 pp. 81–84, 1 fig. Sapporo, March 1935.

Phaeogenes eguchii, sp. n., is described from *Pyrausta nubilalis*, Hb., and *Phygadeuon latipetiolator*, sp. n., from *Dendrolimus spectabilis*, Butl. Both occur in China and Korea. From China, *Pimpla* (*Epiurus*) *persimilis*, Ashm., and *Xanthopimpla punctata*, F., are recorded from *Sylepta derogata*, Hb., and *Zacharops narangae*, Cush., from *Alabama argillacea*, Hb., and from *Parnara guttata*, Brem. *Pimpla persimilis* is new for China; the other two have been recorded from different hosts [*R.A.E.*, A **23** 207]. The parasite of *Cydia* (*Grapholitha*) *molesta*, Busck, previously recorded (with a description) from Japan as *Phaeogenes japonicus*, Ashm. [**21** 648] is really a new species and is here named *P. haeussleri*.

Cheng (Tung-shan). **Biology of** *Naranga aenescens* **Moore in Kiangsu (Lep., Noctuidae). I & II.** [*In Chinese.*]—*Ent. & Phytopath.* **3** nos. 1–2 pp. 7–18, 26–31, 1 graph. Hangchow, China, 1st–11th January 1935. (With a Summary in English.)

Naranga aenescens, Moore, is common throughout Kiangsu Province, particularly in the east and centre, and feeds on graminaceous plants. It causes especially severe damage to rice seedlings. There are usually 3 generations a year though there may be 2 or 4. Five and a partial sixth have been reared in the laboratory. The winter is passed in the pupal stage in a cocoon. About 50 per cent. of the larvae and pupae are attacked by Hymenopterous parasites. The adults, particularly the females, are strongly attracted to light.

Ramachandran (S.) & Ramakrishna Ayyar (T. V.). **Host Plant Index of Indo-Ceylonese Coccidae.**—*Misc. Bull. Coun. agric. Res. India* no. 4, 113+x pp., 2 pp. refs. Delhi, 1934. Price 2*s.* 9*d.* [Recd. April 1935.]

To supplement two previous papers [*R.A.E.*, A **10** 183; **18** 659], the authors give a list of the food-plants of the Coccids of the Indo-Ceylonese region, showing the Coccids found on each species. An index to the plants is included.

Jourdan (M. L.). **Observations sur la biologie d'***Aelia triticiperda* **Pomel.**—*Rev. franç. Ent.* **1** no. 4 pp. 254–262, 1 pl., 13 refs. Paris, 1st March 1935.

The first severe outbreak of the Pentatomid, *Aelia triticiperda*, Pomel, in Morocco since the establishment of the Protectorate occurred in 1933, when it caused considerable damage to wheat. It has two

generations a year. The egg stage varies from 13 days in early spring to 5 in July. The period from hatching to adult varies from 45 to 27 days. The number of eggs laid by one female is frequently 60, generally deposited in masses of 12 at intervals of 24 hours, but may be as high as 300. Females begin to oviposit 3–10 days after pairing and continue for 1–5 weeks. The eggs are deposited on weeds in grain fields, or on the stalks and lower surfaces of the leaves and ears of the cereals ; in one place where the population was excessive some were laid on the soil.

Overwintered adults first appeared in March, before the flowering of the cereals, and paired and oviposited for about a month before disappearing. In May the plants often seem to be free from infestation, but the eggs and young larvae are concealed upon them and great numbers of larvae become active in June. During this month they develop to adults and feed upon the cereals while the ears are forming and when they have matured. They pair at the end of June and oviposit on late cereals in July. Many of the larvae and nymphs from these eggs die. The survivors become adult at the beginning of August and feed on fallen ears left from harvest or on stubble. When the first rains and cold weather occur in October they enter hibernation near the cereals without migrating. Mortality is very high during the last months of hibernation. With the first fine days in spring the survivors become active, but die as soon as they have paired and oviposited.

The eggs of *A. triticiperda* were parasitised by a Scelionid of the genus *Microphanurus*, and the adults by the Tachinid, *Gymnosoma rotundatum*, L. The life-cycle of the former lasted 12–15 days. It destroyed a high percentage of the eggs in 1933, but was not observed in 1934. The adults fed on the flowers of *Euphorbia*. According to observations in both years parasitisation by the Tachinid occurs in June and July. The larvae pupate in the soil.

CHEVALIER (A.). **Les insectes des régimes mâles de l'*Elaeis*.**—*Rev. Bot. appl.* **15** no. 162 pp. 124–125. Paris, February 1935.

Curculionids of the genera *Derelomus* and *Prosoestus* were found on male inflorescences of oil palms (*Elaeis guineënsis*) in Dahomey in 1910 and in the Ivory Coast in 1931. The species found in Dahomey were *D. plagiatus*, Fhr., *D. bilineatus*, Hust., *D. kamerunicus*, Faust, *D. subvittatus*, Faust, *Prosoestus* sp. and *P. sculptilus*, Faust. It is not certain whether these weevils play any part in pollination, as they have not been observed on the female inflorescences, but they appear to be attracted by the odour given off by the male flowers.

DALGARNO (W. T.). **Notes on Biological Control of Insect Pests in the Bahamas.**—*Trop. Agriculture* **12** no. 3 p. 78. Trinidad, March 1935.

Eretmocerus serius, Silv., was introduced into the Bahamas in 1931 for the control of *Aleurocanthus woglumi*, Ashby, on *Citrus*, and as a result of its establishment little spraying against this Aleurodid has been necessary. In July 1932 an unsuccessful attempt was made to introduce *Cryptolaemus montrouzieri*, Muls., from Florida against *Pseudococcus citri*, Risso. *Rodolia cardinalis*, Muls., which was introduced from Porto Rico for the control of *Icerya purchasi*, Mask., in

October 1933 and again in October 1934, is spreading, but not so quickly as was expected. *I. purchasi*, which was first observed in the Bahamas in 1929, has spread steadily on New Providence Island, where it has a large number of food-plants besides *Citrus*.

MONTE (O.). **Borboletas que vivem em plantas cultivadas.** [Lepidoptera living on cultivated Plants.]—*Bol. Agric. Zootecn. Vet. Minas-Gerais* **7** separate Ser. agric. no. 21, 221 pp., 168 figs., 132 refs. Belo Horizonte, 1934. [Recd. April 1935.]

This survey of the Lepidoptera infesting cultivated plants in the State of Minas Geraes, Brazil, opens with a general account of the biology and morphology of Lepidoptera, and the collection and preparation of specimens. In the main section of the work the species are arranged systematically, with notes on their external appearance and food-plants and very brief reference to means of control. There is also a short chapter on insecticides. The book is concluded by three lists of the species ; the first is arranged according to the parts of plants attacked, the second gives popular and scientific names, and the third is arranged by families and shows the food-plants of each species.

HALLER (H. L.) & LAFORGE (F. B.). **Rotenone. XXX. The Non-Crystalline Constituents of Derris Root.**—*J. Amer. chem. Soc.* **56** pp. 2415–2419, many refs. Easton, Pa, 1934. [Recd. April 1935.]

In the course of investigations on rotenone, it was found that the material extracted from derris root by petroleum ether had a higher concentration of the known toxic compounds than have extracts made with other solvents. No toxic compound other than rotenone, deguelin and toxicarol has been found in the uncrystallisable residues.

MILLER (N. C. E.). **The Toxic Value of *Derris* spp.**—*Sci. Ser. Dep. Agric. S.S. & F.M.S.* no. 16, 44 pp., 2 pls., 9 refs. Kuala Lumpur, 1935. Price *Cts.* 50.

Extensive experiments with derris have been carried out in Malaya and are here described in detail. The solutions for spraying and dipping tests had the following strengths : *Derris elliptica*, grown at Kuala Lumpur, 24·5 gm. dry root to 1,000 cc. of water, *D. elliptica*, grown at Serdang, 28·7 gm. and *D. malaccensis* var. *sarawakensis* 21·3. Each was prepared with 75 gm. fresh root and the variation in dry weight was due to the different moisture content of the three kinds of root. The results showed that the three kinds differ little in their insecticidal efficiency and that rotenone content is not necessarily a reliable index to toxic value. With various solutions and dusts prepared in the laboratory 347 tests were made on many species of insects, of which the chief were *Periplaneta americana*, L., and larvae of *Spodoptera pecten*, Guen., and *Aspidomorpha miliaris*, F.

The data from spraying and immersion tests showed great variability in the range of mortality. This was assumed to be due to the varying susceptibility of different species, to variations in the susceptibility of individuals of the same species at different times and to an unequal distribution of the spray fluid in spraying experiments.

Rotenone, deguelin and toxicarol dissolved in acetone were moderately toxic. When tannic acid was added to the solution as a stabiliser,

these substances tended to flocculate at concentrations higher than 1 in 2,000, but it would probably be too expensive to use them at such strengths.

The manner in which derris and its constituents are toxic to insects is not entirely clear, but it is commonly believed that they act as stomach poisons. Baits of derris powder or its ether extract with flour to which chocolate was added, and flour mixed with aqueous solutions of derris seemed to have a repellent effect on *P. americana*. The cockroaches eventually died of starvation, and perhaps from some possible action of derris on the nervous system. In some cases a very small portion of the bait was consumed, but not enough to prove that derris acts as a stomach poison. Finely ground rotenone crystals mixed with tapioca flour were not effective as a stomach poison against *P. americana*. Larvae of *S. pecten* and *A. miliaris*, placed on living plants on which sprays of aqueous derris solutions or suspensions of rotenone had been allowed to dry, died without feeding. The action appeared to be that of a nerve poison, as the larvae died within 24 hours and turned black at death, whereas if the action had been deterrent they would have survived much longer although deprived of food. A derris dust, pure or mixed with a filler, or a lime precipitate of derris were tested against the larvae and adults of various species. The lime precipitate, which gave very good results and seems to have unexplored commercial possibilities, was prepared by adding milk of lime to an aqueous solution. The deposit that remains after the supernatant fluid is drawn off dries into a very fine dust. These materials act either by blocking the spiracles of larvae placed on previously dusted plants or by affecting their nervous system. In the latter case they may also act as repellents. The fact that larvae of *S. pecten* and *A. miliaris* died when they were placed in a desiccator jar, in the lower chamber of which crushed freshly harvested derris roots or an aqueous solution were placed, suggested that derris yields some volatile substance that acts as an asphyxiant. This suggestion was strengthened by the results of an experiment in which larvae of *S. pecten* and *A. miliaris* were immersed in a fluid obtained from derris by steam distillation. The percentage of mortality was 19 and 12 respectively. Air blown under pressure through an aqueous solution of derris on to larvae of *S. pecten* and *A. miliaris* had no lethal effect.

The loss in toxicity of aqueous solutions of derris on standing is far less rapid than it is generally thought to be. Derris in dusts and sprays retains its potency for more than a day in favourable circumstances. Although further experiments are essential before a definite statement can be made, it is probable that derris acts as a repellent to insects and affects the nervous system through the integument.

MUESEBECK (C. F. W.). **Synonymical Notes on *Ecphylus* Foerster, with Description of one new Species (Hym., Braconidae).**—*Proc. ent. Soc. Wash.* **37** no. 1 pp. 21–24. Washington, D.C., 1935.

The author considers that the characters distinguishing *Sactopus* (type *S. schwarzi*, Ashm.) and *Sycosoter* (type *S. lavagnei*, Pic. & Licht. [*R.A.E.*, A **6** 72]) from *Ecphylus* are not of generic value, and that *E. johnsoni*, Rohw., is synonymous with *E.* (*S.*) *schwarzi*, Ashm. *E. rohweri*, n. n., is proposed for *E. schwarzi*, Rohw. nec Ashm. *E. arcuatus*, sp. n., is described from an unknown host in *Tsuga mertensiana* in Oregon.

Silvestri (F.). **Compendio di Entomologia applicata (agraria-forestale-medica-veterinaria).**—Parte speciale, Vol. I (sheets 1–28) pp. 1–448, 414 figs. Portici, 1934. [Recd. 1935.]

This first volume deals with the Apterygota and with the Orders Isoptera, Orthoptera, Embioptera, Dermaptera, Zoraptera, Psocoptera, Mallophaga, Plecoptera, Ephemeroptera, Odonata, Thysanoptera, and Rhynchota (in part). Descriptions are given of the characters, bionomics and control of typical species, chiefly those occurring in Italy.

Zwölfer (W.). **Die praktische Bedeutung der verbesserten Temperatursummenregel in der Forstentomologie.** [The practical Importance of the improved Rule of the Sum of Temperatures in Forest Entomology.]—*Verh. dtsch. Ges. angew. Ent.* **9** (1933) pp. 20–27. Berlin, 1934. [Recd. March 1935.]

This paper explains the application to problems of insect development in forest entomology of Blunck's rule that "effective" temperature multiplied by duration of development is a constant within the limits of a certain biological temperature range [*R.A.E.*, A **13** 389]. The effective temperature is the difference between the average prevailing temperature and the threshold of development. The thermal constant of total development, which is expressed in day-degrees, for any given species can be theoretically determined [*cf. R.A.E.*, A **23** 137]. The temperature sum for any given year is obtained by multiplying the effective temperature during the period in which development takes place by the number of days in that period. The average monthly temperatures are used as a basis. The probability of an insect occurring can consequently be expressed as the quotient of these two sums [*cf. loc. cit.*], and a modification of this method gives an index of the possible number of generations.

The author takes the occurrence of the pine Noctuid [*Panolis flammea*, Schiff.] in Bavaria as an example. The thermal constant of total development is about 1,464 day-degrees C. This is the sum of the thermal constants for the different stages determined experimentally: 160 for pupal development in spring, 143 for the pre-oviposition and oviposition periods, 565 for egg and larval development, and about 596 for pupal development in late summer. The last figure is based on calculations from field data and may be rather too large. In some parts of northern Bavaria, where the moth increased most readily, the temperature sums for the year were 1,536, 1,709 and 1,884 in observed instances. The moth reached its lowest limit of distribution in districts of Upper Bavaria where the temperature sum for the year (*e.g.*, 1,300–1,480 at Munich) barely reached the level of the thermal constant.

Friederichs [K.]. **Versuch einer Erklärung der Forleulenplage in Mecklenburg aus der Waldwirtschaftsform heraus.** [An Attempt to explain Outbreaks of the Pine Noctuid in Mecklenburg in Terms of the Type of Forestry.]—*Verh. dtsch. Ges. angew. Ent.* **9** (1933) pp. 27–29. Berlin, 1934. [Recd. March 1935.]

In regions poor in sunshine and warmth, such as Mecklenburg, the pine Noctuid [*Panolis flammea*, Schiff.] depends largely on local temperatures [*cf. R.A.E.*, A **23** 227], which are produced by solar heat in conjunction with such local conditions as shelter against wind and the nature of the soil. Sandy soil dries rapidly after rain and then

conducts away little warmth. Most pine forests in Mecklenburg are on sandy soil and the heat accumulates over the ground and warms the crowns of the trees. Such favourable conditions occur only in extensive, compact pine forests, such as result from the modern practice of fully stocking woods with trees of the same age. Stands composed of trees of varying ages are not infested in Mecklenburg. *Pinus rigida* is not attacked by the moth.

SCHWERDTFEGER (F.). **Ueber den Verlauf von Insektengradationen. Dargestellt an einigen Forstschädlingen.** [On the Course of Insect Outbreaks, exemplified by some Forest Pests.]—*Verh. dtsch. Ges. angew. Ent.* **9** (1933) pp. 32–41, 7 figs. Berlin, 1934. [Recd. March 1935.]

The various special terms employed in Germany for the different phases of an insect outbreak are explained and illustrated by graphs. Typical curves are given for *Bupalus piniarius*, L., *Panolis flammea*, Schiff., *Dendrolimus pini*, L., and *Sphinx pinastri*, L. The duration in years of the individual phases of an outbreak of each of these four species is tabulated for comparison. Their characteristic differences of variation in abundance are also shown by curves giving the co-efficients of increase.

ANDERSEN (K. T.). **Kurze Mitteilungen über weitere Versuche zur Biologie und Oekologie von** *Sitona lineata* **L.** [Brief Communications on further Experiments on the Biology and Ecology of *S. lineata*.]—*Verh. dtsch. Ges. angew. Ent.* **9** (1933) pp. 42–49, 1 fig. Berlin, 1934. [Recd. March 1935.]

In an experiment in Bavaria on the effect of air humidity on adult feeding and egg-production of *Sitona lineata*, L., a pest of peas and beans, it was found that in 4 days females produced averages of 88, 42, and 40 eggs at 100, 70–75 and 32–35 per cent. humidity respectively, when they were allowed to feed for about 3–4 hours daily. When the eggs laid on the first day were omitted from the count, the numbers averaged 69, 28 and 29. The amount of food taken was sufficient to maintain life, but was inadequate for egg-production. Females lived longer at 75 per cent. humidity than at 100 per cent., but as the humidity decreased below 75 their life became suddenly shorter. In another experiment weevils were continuously supplied with food. The average number of eggs was 48, 28, 104 and 128 at 100, 75, 50 and 17–20 per cent. humidity. The explanation of the discrepancy between the results of these experiments is that more food was eaten as the air became drier, the moisture in the leaves being used to compensate for the loss of body-moisture. These results explain why *S. lineata* in the field remains hidden by day and causes more injury to plants during dry weather.

Previous work had shown that eggs kept continuously at temperatures below about 7°C. [44·6°F.] or above about 33°C. [91·4°F.] failed to hatch. Experiments were made to determine for how long eggs could resist exposure to temperatures above or below these critical points. It was found that 60 per cent. of the eggs hatched after 4 weeks at 6·5°C. [43·7°F.] and also after 22 days at 0°C. [32°F.]. Some hatched after 4 days at 36°C. [96·8°F.]. The very long periods

necessary for determining the length of development at low temperatures may be avoided by exposing the eggs to the low temperature for only $\frac{1}{2}$–$\frac{1}{4}$ the time that development is estimated to take at that temperature and then continuing the experiment at a higher temperature for which the development time is known. A formula for calculating the total period needed at the low temperature is given.

Gösswald (K.). **Ueber die Wirkung von Pyrethrum auf Forstschädlinge.** [On the Effect of Pyrethrum on Forest Pests.]—*Verh. dtsch. Ges. angew. Ent.* **9** (1933) pp. 49–62. Berlin, 1934. [Recd. March 1935.]

In view of the probable future importance of pyrethrum against Lepidopterous pests in Germany, the data up to October 1933 are surveyed, and an account is given of original tests with pyrethrum dust on a number of forest pests [*R.A.E.*, A **21** 435; **22** 345].

Schedl (K.). **Probesammeln bei Freilandversuchen.** [The Collection of Test Material in Field Experiments.]—*Verh. dtsch. Ges. angew Ent.* **9** (1933) pp. 63–84, 4 figs. Berlin, 1934. [Recd. March 1935.]

The author considers some of the most important points the neglect of which has often caused contradictory results in ecological investigations. He believes that a theoretical knowledge of the development and increase of insects is essential for planning and carrying out observations, and illustrates with comments and schematic graphs the way to use and acquire data on the biotic potential, development, variation and mortality in the various stages and resistance to environment. The conditions that must be observed and the methods that must be followed if field data are to be reliable are also outlined.

Maschmeier (W.). **Bekämpfung von Vorratsschädlingen mit Areginal.** [The Control of Store Pests with Areginal.]—*Verh. dtsch. Ges. angew. Ent.* **9** (1933) pp. 84–94. Berlin, 1934. [Recd. March 1935.]

A description is given of successful laboratory experiments in Germany with Areginal against the grain weevil [*Calandra granaria*, L.]. There was a 60–70 per cent. loss of concentration of the Areginal vapour in a model silo containing normally moist grain, which reduced the air-space in the silo by 80–85 per cent. The reduction in the concentration of the vapour by the grain depended on the water content of the latter. The loss was only 33·5 per cent. with wheat containing 10·5 per cent. water and only 28 per cent. with malt containing 5·5 per cent.

Two practical tests were then made with actual grain silos. One of these has already been noticed [*R.A.E.*, A **21** 127]. In the other all individuals of *C. granaria* were killed in malt with a water content of 4·92–7·88 per cent. by using 9 pints Areginal per 1,000 cu. ft. Several other silos have been fitted with special fumigation plants [*cf. loc. cit.*]. In one at Madgeburg the total silo capacity is 14,000 cu. ft. The tank holds 11 gals. Areginal, which is taken to a vapouriser worked by an

electrically heated water-bath and is pumped by a fan to the bottom of the grain chambers, where it passes upwards through the grain. The plant is so constructed as to avoid all chances of fire.

HIMMER [A.]. **Ueber die Einwirkung arsenhaltiger Stäubemittel auf die Bienen.** [On the Effect on Bees of Arsenical Dust Insecticides.] —*Verh. dtsch. Ges. angew. Ent.* **9** (1933) pp. 94–103. Berlin, 1934. [Recd. March 1935.]

Arsenic, especially when applied as a dust, is dangerous to bees; the author has found that the minimum lethal dose, which has been stated to be under 0·001 mg. As [*R.A.E.*, A **22** 267], is in fact 0·00011–0·00014 mg. Instances of the destruction of bees in Germany are given. In one of these all the bees within 3 miles of a wood to which an arsenical dust had been applied by aeroplane were destroyed. Dusting from the air is far more dangerous than dusting from the ground, and evidence is adduced to show that the danger zone from which bees must be removed should extend to 3 miles and 6 miles for power and aeroplane dusting respectively. Arsenical sprays are not dangerous to bees if the blossoms and the flowering undergrowth are left unsprayed.

SCHIMKE (H.). **Ueber die Giftigkeit einiger arsenfreier Bekämpfungsmittel fur die Bienen.** [On the Toxicity to Bees of some non-arsenical Insecticides.]—*Verh. dtsch. Ges. angew. Ent.* **9** (1933) pp. 103–111. Berlin, 1934. [Recd. March 1935.]

In view of the tendency in Germany to replace arsenicals with contact dust insecticides, the author made experiments to see if various proprietary dusts were poisonous to bees. Of these Dusturan, which contains pyrethrum, was a powerful contact poison. As a stomach poison it acted only when very concentrated, but the lethal dose was not ascertained. The contact effect of the other dusts was not so great, but some of them acted as stomach poisons. Some arsenical insecticides were also tested on bees. Pure arsenic trioxide (As_2O_3) did not prove very harmful by contact, but pure arsenic pentoxide (As_2O_5) was very toxic. All the test bees died in 3 hours after dusting with it, and this result is thought to be due to its markedly hygroscopic nature. In view of the difficulty of comparing results by different workers owing to the diversity of the experimental methods used, the author gives a schedule of the conditions and technique which he thinks best suited for this type of investigation.

GEINITZ [B.]. **Bienenverluste durch Spargelschädlingsbekämpfung.** [Loss of Bees due to Measures against Pests of Asparagus.]—*Verh. dtsch. Ges. angew. Ent.* **9** (1933) pp. 111–113. Berlin, 1934. [Recd. March 1935.]

In July 1933 many bees were destroyed in Baden by arsenical sprays applied to asparagus against *Crioceris asparagi*, L., and *C. duodecimpunctata*, L., and from 0·0005 to 0·001 mg. As_2O_3 (more than the minimum lethal dose) was found in bees taken from asparagus fields at flowering time. Honey and pollen from the combs were examined,

and although no arsenic was found in the honey there was 0·0005–0·0014 per cent. As_2O_3 in the pollen. Neither the honey nor the pollen harmed bees fed on them. There is no danger to bees if the blossoms are not sprayed.

ANDERSEN (K. T.). **Analyse des Schadens und des Massenwechsels des linierten Blattrandkäfers** (*Sitona lineata* **L.). Seine Bekämpfung und Abwehr.** [An Analysis of the Variation in Abundance of and Injury done by the Pea Weevil, *Sitona lineata*. Its Control and Prevention.]—*Landw. Jb.* **78** no. 1 pp. 55–79, 1 fig., 12 refs. Berlin, 1933. [Recd. April 1935.]

The author summarises the factors regulating the variation in abundance of a pest. As a rule parasites are more important, in a year of average weather, in preventing a mass increase than in decreasing it. Weather is the main factor in beginning and ending an outbreak.

In order to examine the reasons for fluctuation in the amount of damage by *Sitona lineata*, L., a pest of leguminous crops in Germany, a short account is given of its life-history and of the sort of injury it does [*R.A.E.*, A **19** 588, etc.]. The severity of the damage depends primarily on the population density of the weevil, which in turn depends chiefly on the number of adults that entered hibernation in the preceding year. The effect of temperature and food on egg-production is discussed [**21** 390]. The average number of eggs per female varies from year to year from a few hundreds to almost 2,000. Variation from an average temperature of 22°C. [71·6°F.] at the chief oviposition period and low temperature at the start of egg-production, the duration of which is thereby lengthened, are the causes of a decrease in the number of eggs. Air humidity usually has no noticeable effect on egg-production, as the leaves contain sufficient moisture, but abnormal dryness below 35 per cent. humidity reduces it. Some experiments in progress when this paper was written indicate that very high humidity is more detrimental to egg-production than low humidity, because when the humidity is low the weevil consumes more leaves in order to make good the deficiency in moisture [**23** 297].

In Bavaria the months of May–July, but especially June, are important for oviposition, incubation and hatching, and if sufficiently moist, warm weather occurs an increase of injury in the following year may be expected. Unfavourable weather in March and April may delay the appearance of the hibernated adults, thus postponing oviposition and reducing it.

The areas of permanent injury by *S. lineata* occur in those regions of Europe where clover, peas, beans and vetches are largely grown and where the climate is moist and temperate.

Some suggestions are made on the most practical measures against the weevil. Stubble should be ploughed immediately after harvesting annual leguminous plants in order to destroy the remaining pupae by desiccation. The application of an arsenical dust to the young plants in spring kills the overwintered adults and prevents oviposition. Rapidly growing varieties should be chosen, and the ground should be manured and cultivated so that the young plants pass quickly out of the critical stage of growth and so produce more leaf than the weevils can consume. It would be advisable not to grow peas, beans and vetches for one year; otherwise they should be cultivated well away from fields of clover and similar leguminous plants.

Edwards (E. E.). **Further Experiments (1934) on the Control of the Cabbage Root Fly.**—*J. Minist. Agric.* **42** no. 1 pp. 34–38. London, April 1935.

Experiments during 1931–33 showed that mercury bichloride (1 oz. to 8 gals. water) is the best material to use against the cabbage root fly [*Phorbia brassicae*, Bch.] on crucifers in England [*cf. R.A.E.*, A **22** 363; etc.]. As it is very poisonous, it was tested in 1934 at a weaker strength (1 oz. to 10 gals.). Tests were also made with magnesium sulphate (1¼ oz. to 1 gal.) and a tar distillate wash (1 fl. oz. to 1½ gals.), as these are not poisonous and had given promising results in the laboratory in 1933. The liquids were applied at rates of ¼ pint, 1 pint and 4 fl. oz. per plant, respectively, to the soil at the base of cauliflower plants after transplanting early in June. The plants were at first affected by dry weather at all three centres, but later their growth and general condition improved on all experimental plots. Those treated with mercury bichloride remained particularly flourishing throughout the season. In estimating the amount of damage, healthy-looking plants were regarded as unattacked, whereas those that appeared sickly and unlikely to mature were removed for examination of the roots. In comparison with the control plots, mercury bichloride increased the number of healthy plants by 52 per cent., and magnesium sulphate and tar distillate by about 30. The results obtained with mercury bichloride were less satisfactory than before. The dryness of the soil at the time of transplanting and the hot weather that followed stopped the roots from developing quickly, and one or two additional applications should probably have been made. The numbers of *Phorbia* were about the same in 1934 as in the previous years. The lower concentration affected the results as well, since in a comparative test cauliflowers treated with 1 oz. mercury bichloride in 10 gals. water yielded an average of 25 per cent. less marketable heads than those treated with 1 in 8. In general, the tar distillate wash gave slightly better results than magnesium sulphate, but the difference was not of practical significance.

Casella (D.). **L'agrumicoltura siciliana.** [*Citrus* Growing in Sicily.] —*Ann. Staz. sper. Frutt. Acireale* N.S. **2** pp. 1–147, 35 pls. Acireale, 1935.

This monograph on the cultivation of *Citrus* in Sicily contains a section (pp. 90–98) on the damage caused by insects and the means of controlling them. Coccids are the chief pests, and an organisation exists for combating them, mainly by means of fumigation with hydrocyanic acid gas [*R.A.E.*, A **23** 184].

Costantino (G.). **Tavola dosimetrica per la fumigazione cianidrica invernale contro la Bianca-rossa ed altre cocciniglie degli agrumi.** [A Dosage Table for Winter Fumigation with HCN against *Chrysomphalus dictyospermi* and other Coccids of *Citrus*.]—*Ann. Staz. sper. Frutt. Acireale* N.S. **2** pp. 151–154, 1 fldg table. Acireale, 1935. **Tavola dosimetrica per la fumigazione invernale contro l'Aspidioto ed il Lepidosafe degli agrumi.**—*T.c.* pp. 155–156, 1 fldg table.

Supplementing the dosage tables for summer tent fumigation of *Citrus* with hydrocyanic acid gas in Sicily [*R.A.E.*, A **23** 184], the

first of these papers gives a table for winter fumigation against *Chrysomphalus dictyospermi*, Morg., *Parlatoria zizyphus*, Lucas, *Icerya purchasi*, Mask., *Saissetia oleae*, Bern., and *Coccus hesperidum*, L. The second gives the corresponding table for use against *Aspidiotus hederae*, Vall., and *Lepidosaphes beckii*, Newm. (*citricola*, Pack.).

MALENOTTI (E.). **Terzo contributo alla lotta contro i nemici del melo.** [A third Contribution to Work against Apple Pests.]—*Italia agric.* **72** no. 3 pp. 217–237, 18 figs. Rome, March 1935.

Compared with previous results [*R.A.E.*, A **21** 372; **22** 250], no new essential facts were noted in 1934 in work against *Cydia pomonella*, L., in Venetia. Probably because of wet weather, 5 lb. lead arsenate to 100 gals. gave a slightly better result than 3 lb. As a rule 6 applications of the spray gave better results than 4. The substitution of 2·5 per cent. lime-sulphur for 1 per cent. Bordeaux mixture with the lead arsenate did not decrease the insecticidal or fungicidal action of the spray. The numbers of larvae collected from trap-bands of rag were closely related to the numbers of infested apples that fell from the trees. There appeared to be a partial third generation, and a few larvae were still seeking shelter nearly a month after the end of the apple harvest. The old mines of *Cossus cossus*, L., should be sealed to prevent larvae of *Cydia* from hibernating in them. As in 1933, 4–5 per cent. lime-sulphur was effective against *Stephanitis pyri*, F., but all varieties of apple did not tolerate this strength.

BRUNETEAU (J.). **Considérations sur les traitements des arbres fruitiers.** —*Rev. Zool. agric.* **31** nos. 11–12 pp. 169–174, 185–200, 14 refs. **34** nos. 1–2 pp. 1–12, 21–31, 21 refs. Bordeaux, 1932, 1935.

A popular account is given of the treatments that have proved valuable against the chief insect and fungus pests of fruit trees in the south-west of France. The first part of the paper consists of a general introduction dealing with the natural resistance of plants to attack, natural enemies of insects and such supplementary measures of control as banding, bait traps, etc. The second part is concerned with winter treatments, which include cultural measures. The most useful washes and sprays are discussed. The third and fourth parts deal with measures that should be taken in spring and summer, particularly those that should be applied against *Cydia pomonella*, L., and Aphids on apples.

BOUHÉLIER (R.). **Observations sur quelques Coccinelles coccidiphages au Maroc.**—*Rev. Zool. agric.* **34** no. 2 pp. 17–20. Bordeaux, February 1935. [Recd. April 1935.]

In Morocco, Coccids are rarely attacked to any great extent by Coccinellids, although these are fairly numerous. From a small consignment obtained from Spain, *Cryptolaemus montrouzieri*, Muls., was reared in the laboratory at Casablanca and liberated on hedges of *Myoporum* infested by *Pseudococcus citri*, Risso [*cf. R.A.E.*, A **21** 62]. It was only sometimes useful, though it survived the rather mild winter of 1933–34. It is apparently only effective against heavy infestations

of *Pseudococcus* when it is released in large numbers. Larvae and adults of *Exochomus flavipes* var. *nigripennis*, Erichson, which had previously been recorded as feeding only on Aphids, were observed to attack *P. citri*. In rearing experiments this Coccinellid reproduced rapidly and appeared likely to be of great value in destroying the mealybug. It is indigenous and subject to some parasitism.

In 1929, *Chilocorus bipustulatus*, L. [*cf.* **20** 451] considerably reduced the numbers of *Diaspis visci*, Schr., infesting cypress [*Cupressus*] used for wind-breaks in *Citrus* plantations, and attacked *Chrysomphalus dictyospermi*, Morg., which was abundant on *Citrus*, but without greatly reducing its numbers. In 1934, however, the Coccinellid caused such high mortality among *Chrysomphalus* on trees that had previously been heavily infested that the usual control measures were unnecessary. A Hymenopterous parasite and perhaps a fungus were also partly responsible. After some weeks large numbers of the larvae of the Coccinellid were destroyed by a Hymenopterous parasite and many of the adults were carrying spores of a parasitic fungus on their elytra. *C. bipustulatus* only occasionally attacks mealybugs, but larvae and adults were discovered in a centre of infestation of *Phoenicococcus marlatti*, Ckll., at Casablanca in 1929.

Hargreaves (E.). **Entomological Work.**—*Rep. Dep. Agric. S. Leone 1933* pp. 12–14. Freetown, 1935.

Of fruit-piercing Lepidoptera that appeared on *Citrus* in Sierra Leone early in May 1933, only *Achaea mormoides*, Wlk., was unusually abundant. The climbing plant attacked by the larvae of *Othreis divitiosa*, Wlk. [*cf. R.A.E.*, A **21** 446] was identified as *Dioscoreophyllum leonense*, but its most important food-plant was found to be *Rhigiocarya racemifera*, which is common and widespread. *Tiliacora* sp. is attacked by *O. fullonica*, L., and possibly also by *O. materna*, L. The larvae were most numerous in late October and in November. A generation from egg to egg occupies 35–40 days. Both *O. fullonica* and *O. divitiosa* are capable of depositing about 300 eggs in the first batch. No adults were observed in the field after the emergence of the main brood of *O. fullonica* in the second half of November or of *O. divitiosa* in December, and it appears that, like *A. catocaloides*, Gn. [*cf. loc. cit.*], they migrate. Control measures will have to be directed against the adults or to limiting the production of the crop to October-February, when they are scarce.

Symptoms of the dark-veined type of mosaic disease developed on ground-nuts 12–13 days after the feeding of the aphis [*Aphis laburni*, Kalt., *cf. loc. cit.*]. Reinfestation probably accounts for the poor results of periodical spraying against *Pentalonia nigronervosa*, Coq., on bananas. This method of control appears to be impracticable, since sprays would have to be repeated at very short intervals or applied to all the bananas in the surrounding district. Good results were obtained by removing the terminal parts of the inflorescences soon after the setting of the fruit. Until early May only about 30 small swarms of locust hoppers developed, these being dealt with during May–June, but a further invasion occurred at the end of October, and from the eggs laid during November, hoppers of the swarming phase hatched in December. Comparatively little damage was caused.

Conférence faite par Monsieur W. F. Jepson à la Chambre d'Agriculture le 16 Janvier 1935.—*Rev. agric. Maurice* no. 79 pp. 24–27. Port Louis, 1935.

An account is given of the situation regarding *Lachnosterna* (*Phytalus*) [*smithi*, Arrow] on sugar-cane in Mauritius and its control, chiefly by natural enemies [*cf. R.A.E.*, A **22** 621 ; **23** 68]. Liberations have been made of a species of *Campsomeris* obtained from Porto Rico and of another from Rodrigues.

Summerville (W. A. T.). **Red Scale of** *Citrus*.—*Qd agric. J.* **43** pt. 2 pp. 140–144, 1 fig. Brisbane, 1st February 1935.

The information given on the bionomics and control of red scale [*Aonidella aurantii*, Mask.] on *Citrus* in Queensland is similar to that included in a previous paper [*R.A.E.*, A **22** 711].

Raff (J. W.). **Observations on the Saw-flies of the Genus** *Perga*, **with Notes on some reared Primary Parasites of the Familes Trigonalidae, Ichneumonidae, and Tachinidae.**—*Proc. roy. Soc. Vict.* N.S. **47** pt. 1, pp. 54–77, 2 pls., 2 figs., 14 refs. Melbourne, 22nd December 1934. [Recd. March 1935.]

Comprehensive data are recorded on the development, from the time the larvae entered the soil to spin their cocoons until the adults emerged, of various broods of the sawflies, *Perga nemoralis*, Wilson, *P. polita*, Leach, and *P. dorsalis*, Leach, in Victoria [*cf. R.A.E.*, A **18** 340]. The duration of the prepupal stage varies considerably even in individuals of the same brood, and in one example of *P. nemoralis* it was nearly 4 years. This prolongation has not apparently been previously recorded for Australian sawflies. The pupal period is probably short. The females seem to be more numerous than the males and emerge later.

The primary parasites included *Tapinogonalos* (*Trigonalis*) *maculatus*, Sm., Ichneumonids, and a Tachinid. Ichneumonids were commonly the only parasites in any given brood, but Trigonalids were sometimes present as primary parasites in different individuals of that brood. So far the latter have always been recorded as secondary parasites and have recently been reported from Ichneumonids. The Tachinid was the commonest parasite. As many as 5 larvae were found in a single prepupa, but 1 or 2 seems to be the normal number. They leave the host and pupate within its cocoon.

Liu (Chi-ying). **Notes on the Life History and Control Measures of the Paddy Skipper** (*Parnara guttata* **Bremer**). [*In Chinese.*]—*Yearb. Bur. Ent. Hangchow* **3** (1933) pp. 27–32, 1 pl. Hangchow, October 1934. (With a Summary in English.) [Recd. April 1935.]

Parnara guttata, Brem., causes annual damage to rice in Kiangsu, Chekiang, Hunan and Kiangsi. The adults hibernate from September to early May, and the generations occupy about 50, 30 and 40 days, respectively, the first being the least numerous and destructive. During July and August 44–67 per cent. of the larvae and pupae are attacked by parasites, 60 per cent. of which belong to two species of Sarcophagids.

Cheng (Fong-ge), Peng (Peng) & Li (An-ming). **An Investigation on the Prevalence of** *Icerya purchasi* **Mask. and its Damage in Hwang-yeh District in 1933.** [*In Chinese.*]—*Yearb. Bur. Ent. Hangchow* **3** (1933) pp. 139–143, 3 figs. Hangchow, October, 1934. (With a Summary in English.) [Recd. April 1935.]

Infestation of *Citrus* by *Icerya purchasi*, Mask., which was particularly light in 1933 in areas where it had been heavy during 1932, is more severe in the north and south of Hwang-yeh than in the east and west, where only a few orchards are attacked.

Tsang (Nai-ping). **Observation on the Life History of the Mulberry Pyralid,** *Margaronia pyloalis* **Walk., at Kashing.** [*In Chinese.*]—*Yearb. Bur. Ent. Hangchow* **3** (1933) pp. 144–152, 1 pl. Hangchow, October 1934. (With a Summary in English.) [Recd. April 1935.]

In Kashing (Chekiang), mulberry is often attacked by two Pyralids, of which the commoner is *Margaronia pyloalis*, Wlk. This species has 4–5 generations a year, and the larvae hibernate in crevices or holes in the trunk and main branches. The moths are most abundant in late May, early July and during August-September. Unmated males and females live for averages of 10 and 16·5 days, respectively, and mated ones for 5·9 and 5·5. The female lays about 200 eggs in 3 batches on the lower surface of the leaves. They hatch in 3 days. The larva feeds on the leaf and later rolls it into a funnel, in which it feeds and finally pupates. The larval stage lasts about 17 days in summer, and the pupal stage about 10.

Chu (Joo-tso). **Investigation on the Egg-parasites of the Mulberry White Caterpillar (***Rondotia menciana* **Moore) with Notes on their Liberation Experiments at Hangchow in 1932–33.** [*In Chinese.*]—*Yearb. Bur. Ent. Hangchow* **3** (1933) pp. 163–169, 1 pl., 2 figs. Hangchow, October 1934. (With a Summary in English.) [Recd. April 1935.]

Investigations during 1929–33 on the egg parasites of *Rondotia menciana*, Moore, on mulberry [*cf. R.A.E.*, A **22** 125] showed that *Telenomus* sp. is five times as numerous as *Ooencyrtus* sp. The ratio of males to females is 4 : 2 and 7 : 3, respectively. The degree of parasitism varies in different places, seasons and positions. It is higher in Kiangsu than in Chekiang and in the uncovered summer eggs than in the hibernating ones. In the summer 77·85 per cent. of the eggs on the surface layer of a parasitised mass and 33·62 on the bottom layer are affected. The corresponding figures for winter masses are 48·56 and 11·54. In 1932 the release of about 10,000 parasites over an area of 6,000 sq. ft. increased the parasitism of the hibernating eggs from 2·02 to 9·27 per cent. The percentage of parasitism in the summer eggs was 55·23 as against 8·49 per cent. in areas about 400 ft. away.

Ma (Tsing-chao). **Bionomics of** *Cyrtotrachelus* **sp. in Hangchow. (With Notes on the comparative Morphology and Ethology of this Species and** *C. longimanus* **Fabr.).** [*In Chinese.*]—*Yearb. Bur. Ent. Hangchow* **3** (1933) pp. 171–182, 7 figs., 21 refs. Hangchow, October 1934. (With a Summary in English.) [Recd. April 1935.]

Cyrtotrachelus sp. is an important pest of bamboo in numerous localities in Chekiang and possibly throughout all bamboo forests in

the Province, except in the south-east. The weevils appear from mid-April to mid-June and oviposit beneath the sheath of the young shoots or stems. The larvae appear from late April to late June and their feeding within the young stems, shoots or buds of new branches gives the bamboo an abnormal appearance. They pupate in the soil. The damage differs in severity in the varieties of bamboos. Judged by its morphology and biology, this species is probably distinct from *C. longimanus*, F., which occurs in southern China [*R.A.E.*, A **18** 535], Formosa and India.

Li (Fweng-swen) & Ma (Tsing-chao). **A Synopsis of Cotton Insects in China.** [*In Chinese.*]—*Yearb. Bur. Ent. Hangchow* **3** (1933) pp. 185–187, 1 fldg table, 66 refs. Hangchow, October 1934. (With a Summary in English.) [Recd. April 1935.]

A preliminary list is given of 116 pests of cotton in China, including data, most of which is recorded for the first time, on their distribution and alternative food-plants, the stage of each species that is injurious and the part of the cotton plant it attacks.

The most important include *Oxycetonia jucunda*, Fald., and *Popillia mutans*, Newm., which only feed on cotton in the adult stage, *Platyedra* (*Pectinophora*) *gossypiella*, Saund., *Agrotis c-nigrum*, L., *A. ypsilon*, Hfn., *Earias cupreoviridis*, Wlk., *Heliothis obsoleta*, F., *Sylepta derogata*, F., *Aphis gossypii*, Glov., *A. maidi-radicis*, Forbes, *Atractomorpha ambigua*, Boliv., *A. bedeli*, Boliv., *Gryllus mitratus*, Hagenbeek, *Gryllotalpa africana*, P. de B., *Thrips tabaci*, Lind., and *Tetranychus telarius*, L.

Chu (Joo-tso). **Notes on the Biology of *Cedria paradoxa* Wilkinson, a Hymenopterous Parasite of the Mulberry Pyralid (*Margaronia pyloalis* Walker).** [*In Chinese.*]—*Yearb. Bur. Ent. Hangchow* **3** (1933) pp. 193–202, 1 pl., 2 figs. Hangchow, October 1934. (With a Summary in English.) [Recd. April 1935.]

Cedria paradoxa, Wlkn., is an important parasite of the larvae of *Margaronia pyloalis*, Wlk., in China. The female lays up to 84 eggs in 2 or 3 different hosts ; it guards each batch until the adults emerge before flying away to continue oviposition. In Hangchow, this Braconid had 6 generations a year, the rate of development of which varied from 10 days at an average of 90·25°F. to 27 days at 63·15°. The fertilised females overwinter and may live up to 253 days. In summer adults lived about 22 days at an average temperature of 86°F. and 109 days at 52·5°F. Some survived for 155 days at 50–60°F. With parthenogenetic reproduction the progeny are males, but with sexual reproduction more than 80 per cent. are usually females.

de Carvalho (J. Hygino). **Ligeiras notas sobre o combate á saúva.** [Notes on combating *Atta sexdens.*]—*Publ. Serv. Defesa sanit. veg. Minist. Agric. Brazil* no. 3, 18 pp., 21 figs. Rio de Janeiro, 1935.

The leaf-cutting ant, *Atta sexdens*, L., is a dangerous pest in Brazil, owing to the enormous number of leaves it removes to its nests in order to form beds for the fungus, *Rozites gongylophora*, which is its sole food. A popular description is given of the various forms of this ant together with detailed information on methods and equipment for fumigating the nests.

WILLE (J.). **Las Queresas de las Plantas Cítricas y métodos para combatirlas.** [The Scales of *Citrus* Plants and Methods for Controlling them.]—*Circ. Estac. exp. agríc. Minist. Fom.* [*Peru*] no. 26 pp. 5–15, 9 figs. Lima, 1934. [Recd. April 1935.]

This is a popular account of the bionomics and control of the Coccids attacking *Citrus* in Peru: *Lepidosaphes beckii*, Newm., the most important, *Selenaspidus articulatus*, Morg., *Coccus hesperidum*, L., *Saissetia oleae*, Bern., *Prontaspis* (*Chionaspis*) *citri*, Comst., and *Pseudococcus* sp.

WILLE (J.). **Las especies peruanas de moscas de la fruta del género** *Anastrepha* **Schiner (fam. Trypetidae).** [The Peruvian Species of the Fruit-flies of the Genus *Anastrepha*.]—*Circ. Estac. exp. agríc. Minist. Fom.* [*Peru*] no. 27 pp. 3–12, 10 figs. Lima, 1934. [Recd. April 1935.]

This paper, which is based on Greene's revision of the genus *Anastrepha* [*R.A.E.*, A **22** 538], gives a list of the Peruvian species with a key to them.

WILLE (J.). **Dos informes sobre el Arrebiatado,** *Dysdercus ruficollis*. [Two Reports on *D. ruficollis*.]—*Circ. Estac. exp. agríc. Minist. Fom.* [*Peru*] no. 28 pp. 5–14, 2 fldg tables. Lima, 1934. [Recd. April 1935.]

An account is given of experiments and observations in 1934 in Peru to test del Busto's method of irrigating cotton plants as a measure against the cotton stainer, *Dysdercus ruficollis*, L. This practice appeared to destroy only a small percentage of the eggs and larvae.

EDDY (C. O.). **Soybean Oil Meal emulsifies Mineral Oils.**—*Trans. Kentucky St. hort. Soc.* **1933** pp. 139–141. (Abstr. in *Exp. Sta. Rec.* **72** no. 2 p. 219. Washington, D.C., February 1935.)

Following laboratory work in Kentucky during 1932–33, in which soybean oil meal showed promise as an emulsifier for mineral oils used as dormant sprays, this meal was used to prepare emulsions by the tank-mixture method. Such emulsions did not harm the plants and gave just as good results as those made with calcium caseinate. The meal has also proved satisfactory for making stock emulsions containing 83 per cent. oil. In preliminary tests these emulsions were not affected by freezing. About 10 per cent. caustic potash (potassium hydroxide) is needed with the meal, since it is very nearly neutral. "Soybean oil meal may be prepared for emulsification purposes by cooking 1 part meal with about 150 parts water until all of the meal is in a perfectly smooth condition, after which about 10 per cent. caustic potash (based on weight of soybean meal) should be added with constant stirring. After this procedure the meal used in the experiments mentioned was in the condition of a jell. It is necessary to use about 10 per cent. of this soybean jell to make an 83 per cent. oil emulsion." The soybean oil meal had a protein content of 66·8 per cent., fat 2·7, ash 2·7, moisture 8·6 and nitrogen-free extract 19·2.

McGregor (E. A.). **Investigations of Sulfur Dust for Citrus Thrips and certain Scales.**—*Calif. Citrogr.* **19** no. 9 pp. 232, 254–256, 9 figs. (Abstr. in *Exp. Sta. Rec.* **72** no. 2 pp. 219–220. Washington, D.C., February 1935.)

Experiments on the relation of fineness of sulphur dusts to their effectiveness against the citrus thrips [*Scirtothrips citri*, Moult.] have already been noticed [*R.A.E.*, A **22** 419]. As the thrips was not seriously abundant generally in southern California during 1933, dusts of sulphur and in one orchard sprays of lime-sulphur were applied chiefly during October or earlier against the citricola, black and yellow scales [*Coccus pseudomagnoliarum*, Kuw., *Saissetia oleae*, Bern., and *Aonidiella citrina*, Coq.]. Dusting with sulphur is most effective in the hotter, inland districts; it does not appear to show any economic possibilities in the strictly coastal areas. Its use might allow the development of excessive infestations of the red scale [*Aonidiella aurantii*, Mask.], against which it has little effect. A full dusting programme with sulphur against *Saissetia* might cause too much scorching during the high temperatures in June–August. Lemons are particularly subject to injury in orchards divided by windbreaks. Where an orchard is surrounded by hedges or trees, the air circulates less and the sulphur gas concentration becomes relatively high.

Carter (W.). **The Symbionts of** *Pseudococcus brevipes* **(Ckl.).**—*Ann. ent. Soc. Amer.* **28** no. 1 pp. 60–71, 4 pls., 4 refs. Columbus, Ohio, March 1935.

An account is given of further studies on the symbionts of *Pseudococcus brevipes*, Ckll. [*cf. R.A.E.*, A **23** 166].

The following is taken from the author's summary: The symbionts of *P. brevipes* are enclosed within a mycetome, as in other species of the same genus of mealybugs. The species is bi-symbiotic. One species of symbiont is sometimes yeast-like but is extremely polymorphic. This species is apparently not definitely affected by the insect's food-plant. The rod-shaped symbiont [*loc. cit.*] is also polymorphic, but its polymorphism is governed apparently by the food-plant of the insect. The systematic position of the symbionts cannot be determined without cultivation on artificial media, and this has not been accomplished. Congenital transmission of the symbionts is shown to occur in much the same manner as in *P. citri*, Risso, but in the case of *P. brevipes* aggregates of "infection stages," which are themselves very small, pass from the adult mycetome to the developing egg. Symbiosis is probably allied with nutrition as an ecological factor.

Houser (J. S.). *Cacoecia rileyana* **Grote. An unusual Occurrence (Tortricidae: Lepidoptera).**—*Ann. ent. Soc. Amer.* **28** no. 1 pp. 105–108, 1 pl., 3 refs. Columbus, Ohio, March 1935.

An outbreak of *Tortrix* (*Cacoecia*) *rileyana*, Grote, was observed in Ohio in May 1934 in a 6-acre field planted with low-growing, shrub-like trees. Many of the trees were covered with webs, and between some there was a webbed carpet, probably constructed by the larvae as they migrated to fresh feeding grounds. The larvae were nearly full-grown. The trees most infested were *Aesculus glabra*, hickory and, to a less

extent, hazel (*Corylus americana*) ; black walnut (*Juglans nigra*) and American elm (*Ulmus americana*) were avoided. An adjoining woodland of tall trees was not attacked. From a webbed mass of material taken to the laboratory, 127 moths and 46 parasites emerged in June. Of these 38 were *Pimpla* (*Itoplectis*) *conquisitor*, Say, 5 *Brachymeria ovata*, Say, and 3 *Microdus* (*Bassus*) *agilis*, Cress. By mid-July the moth had quite disappeared.

Janes (M. J.). **Oviposition Studies on the Chinch Bug,** *Blissus leucopterus* **(Say).**—*Ann. ent. Soc. Amer.* **28** no. 1 pp. 109–120, 4 figs., 9 refs. Columbus, Ohio, March 1935.

The following is substantially the author's summary of studies carried out in Iowa during the spring and summer of 1934. Thirty-four overwintered females of *Blissus leucopterus*, Say, laid an average of 544 eggs. One produced 1,091 eggs. Overwintered females laid a greater number of eggs than those of either of the two succeeding summer generations. Egg production was greater at 29·5°C. [85·1°F.] than at either 24·5°C. [76·1°F.] or 34·5°C. [94·1°F.], but the females lived longest, 75 days on the average for the first and 72 for the second generation, at 24·5°C. The longevity of males exceeded that of females and some lived for nearly four months.

Ebeling (W.). **A new Scolytid Beetle found in the Bark of Lemon Trees (Coleoptera, Scolytidae).**—*Pan-Pacif. Ent.* **11** no. 1 pp. 21–23, 2 figs. San Francisco, Calif., January 1935.

The female of *Hypothenemus citri*, sp. n., is described from dead bark and sapwood of lemons in California. The male is unknown. This Scolytid was numerous in a grove in the autumn of 1932, but did not infest healthy wood or bark.

Baker (W. A.) & Jones (L. G.). **Studies of** *Exeristes roborator* **(Fab.), a Parasite of the European Corn Borer, in the Lake Erie Area.**—*Tech. Bull. U.S. Dep. Agric.* no. 460, 26 pp., 2 pls., 7 figs., 6 refs. Washington, D.C., November 1934. [Recd. March 1935.]

In laboratory studies of *Pimpla* (*Exeristes*) *roborator*, F., a parasite of *Pyrausta nubilalis*, Hb., a temperature of 80°F. and a relative humidity of 70 per cent. gave the best conditions for its development. Variations in temperature and moisture tend to react adversely, particularly if the variation is toward higher temperatures without higher relative humidities. The technique of rearing on a large scale is described in detail ; the eggs are removed from the host on which they were deposited, and each is placed on a larva paralysed by immersion for 10 minutes in water at exactly 49°C. [120·2°F.]. Many factors, such as seasonal variations and the type and quantity of food, contribute to the occurrence of a larval diapause, but apparently no single factor controls it. The parasite best survives the diapause when it is kept at 33–36°F. The tendency to a diapause does not seem to be heritable. Attempts to break the diapause have met with little success, since the mortality became too great, except when the larvae were exposed to low temperatures for long periods. The adult female first paralyses the host larva in the stalk and then deposits an egg on or near it.

Little preference is shown in the selection of a host, but only fifth-instar larvae will support the parasite to maturity. Hatching and all larval development takes place externally on the host. Between 7 and 9 days after hatching, when the parasite larva is fully fed, it spins a cocoon in the borer tunnel, where it remains for 5 days and then pupates. The adult emerges 10 days later. There is a preoviposition period of 5–7 days after pairing, and then oviposition continues for 18–20 days. In 1929 under field conditions isolated females deposited 1–9 eggs a day and totals of from 1 to 83. Field studies indicated that the factors limiting the effectiveness of the parasite in the Lake Erie area of the United States are its low biotic potential under field conditions and the imperfect coincidence between the seasonal cycles of it and *Pyrausta*. It is apparently incapable of maintaining itself in those parts of the Lake Erie area that are at present infested by the corn borer. A number of colonies released when it was introduced did not produce succeeding generations.

SHOTWELL (R. L.). **The Species and Distribution of Grasshoppers Responsible for the 1934 Outbreak.**—*Insect Pest Surv. Bull.* **14** no. 9 pp. 299–327. Washington, D.C., U.S. Dep. Agric., Bur. Ent. [1935.]

A survey of adult grasshoppers was made in the more heavily infested areas of the United States during July and August 1934 to determine the results of the poisoning campaigns and to ascertain where grasshoppers were still abundant and where eggs might be found during the autumn. Data are given on the species responsible for the outbreak and their distribution in some of the more common habitats. *Melanoplus mexicanus*, Sauss., was the most widespread and destructive to crops [*cf. R.A.E.* **21** 649; **22** 256], and *Camnula pellucida*, Scudd., came next. Both species were important even on grazing lands. *C. pellucida* was most abundant at higher elevations or in more northern latitudes. *M. bivittatus*, Say, and *M. differentialis*, Thomas, which were widespread in 1931 and 1932 [*cf.* **20** 410; **21** 238], were reduced to negligible numbers in 1933 and 1934 by the drought that ruined cultivated crops. *M. mexicanus* and *C. pellucida* withstood the drought because they are better adapted to feeding on dry native grasses.

KING (K. M.), ARNASON (A. P.) & GLEN (R.). **The Wireworm Problem in Field Crops of western Canada. A Discussion of Eleven Years' Results.**—*Saskatoon Leafl. ent. Br. Dep. Agric. Canada* no. 35, 21 pp. multigraph. Saskatoon, Sask., January 1933. [Recd. April 1935.]

Detailed information is given on the economic importance and bionomics of wireworms damaging wheat and other small grain crops in western Canada and particularly on their control by means of cultural measures [*R.A.E.*, A **16** 509; **21** 479]. *Corymbites* (*Ludius*) *aeripennis*, Kby. (*tinctus*, Lec.) is the chief species in the Prairie Provinces and *Hypnoidus* (*Cryptohypnus*) *nocturnus*, Esch., may occur with it, but in less abundance. *C.* (*L.*) *kendali*, Kby., and *Limonius pectoralis*, Lec., may occur in the park belt, and *H.* (*C.*) *abbreviatus*, Say, and *Dolopius* sp. have recently become increasingly troublesome there.

King (K. M.) & Glen (R.). **Clothes Moths and Carpet Beetles in Saskatchewan.**—*Saskatoon Leafl. ent. Br. Dep. Agric. Canada* no. 39, 4 pp. multigraph. Saskatoon, Sask., April 1934. [Recd. April 1935.]

The usual measures are recommended against clothes moths, the black carpet beetle [*Attagenus piceus*, Ol.] and the buffalo carpet beetle [*Anthrenus scrophulariae*, L.], the bionomics of which in Saskatchewan are briefly discussed. Clothing and upholstered furniture may be exposed to frosts. Fabrics, particularly carpets, rugs and the mohair of upholstered furniture, may be rendered permanently mothproof by impregnating them with sodium fluosilicate dissolved in warm water at the rate of 1 oz. to 1 gal.

King (K. M.), Glen (R.), Berg (V. L.) & McMahon (H.). **Grasshopper Egg Survey in Saskatchewan, Autumn 1934 : Complete Data.**—*Saskatoon Leafl. ent. Br. Dep. Agric. Canada* no. 40, 46 pp. multigraph. Saskatoon, Sask., December 1934. [Recd. April 1935.]

During a grasshopper egg survey carried out in Saskatchewan in 1934, the degree of field and roadside infestations was estimated from the average number per sq. ft. of eggs of *Melanoplus mexicanus*, Sauss., and egg-pods of *Camnula pellucida*, Scud. The results are shown in a table. The severity of an expected outbreak in a given area is apparently determined not only by the abundance of grasshopper eggs but also by the type of soil. Crops in areas with heavy soil suffer less damage than those in lighter soil because the plants are more resistant and the eggs hatch later in spring. This also applies to some extent to roadside infestations. In the case of *Melanoplus*, less than 5 eggs per sq. ft. in light soil indicates that infestation will not be economic and 30 or more indicates that it will be very severe. The figures should be doubled for heavy soil. Even in the absence of a serious field infestation there may be a severe outbreak of the roadside species, *C. pellucida*. In light or medium soils 30 or more egg-pods per sq. ft. indicate a very severe infestation. In heavy soils the corresponding figure is 40 or more egg-pods per sq. ft. If egg-pods are found at all, the infestation is of economic importance. Both the field and roadside infestations contribute to the outbreak in any area, but the expected severity is not necessarily the exact sum of the two. The results in any field, especially if the count is low, are significant only when taken with the adult survey and the data about eggs in other fields of the same locality. As sod infestations tend to vary greatly, at least 50 samples should be examined from various parts of a field before the severity of the infestation is determined.

Sherman III (F.). **Drained Crankcase Oil for Codling Moth Bands.**—*J. econ. Ent.* **28** no. 1 p. 31. Geneva, N.Y., February 1935.

In tests in Michigan in 1934, bands chemically treated with 1½ U.S. pints drained crankcase oil and 1 lb. beta naphthol were as effective in killing larvae of the codling moth [*Cydia pomonella*, L.], as those treated with beta naphthol and unused oil. To be effective, rolls of 4-inch bands 125 feet long must weigh 10–12 lb. after treatment.

Phillips (E. F.). **The increasing Complexities of Economic Entomology.**—*J. econ. Ent.* **28** no. 1 pp. 32–46. Geneva, N.Y., February 1935.

The author attempts to summarise the influence on economic entomology of factors originating in economic, political and international conditions.

Ries (D. T.). **A new Mite** (*Neotetranychus buxi*, **n.s. Garman**) **on Boxwood.**—*J. econ. Ent.* **28** no. 1 pp. 55–62, 4 figs., 3 refs. Geneva, N.Y., February 1935.

Garman's description of *Neotetranychus buxi*, a new mite found in 1932 infesting boxwood [*Buxus*] in a number of localities in Michigan, is included in this paper. It has not been found in other parts of the State or in neighbouring States where boxwood is grown, and material from the nurseries from which the infested plants originated showed no trace of it. The mites feed on the leaves, which become mottled and finally wither and drop. The overwintering eggs hatch at the end of April and beginning of May. The mites mature after three moults, the first and third of which are preceded by a quiescent period. The entire life-cycle is completed in 18–21 days. There are at least 8 generations a year. The adults move rapidly from one part of the plant to another, feeding mostly on the tender shoots and upper surface of the leaves. Some females live as long as 6 weeks in summer, whereas others lay their full complement of eggs and die within 2 weeks. Most of the overwintering eggs are laid during late September and early October, all stages being found on the plants after the latter part of May. A female lays 25–35 eggs singly, depositing 1–5 during 24 hours. It is thought that parthenogenetic reproduction occurred in the laboratory.

High temperatures (65–88°F.) and low humidity (45–55 per cent.) tend to shorten the life-cycle by several days in summer. Experiments under controlled conditions indicated that relative humidity is the more important factor. Rather high humidity combined with low temperatures during April and early May tended to lengthen the various instars. High humidity with rising temperatures seemed to account for the postponement of oviposition for nearly a week after the emergence of first generation adults in May.

Tests were made with a number of contact insecticides. Sprays of nicotine (1 : 800) with the addition of soap or molasses killed 98 per cent. of the adults in 24 hours and after an interval of 10 days had prevented 40 per cent. of the eggs from hatching. Powdered glue (1 lb. to 5 U.S. gals. water) killed 99·2 per cent. of the adults, gave good results against the quiescent stages and prevented 94 per cent. of the eggs from hatching. A selenium compound also showed promising results against eggs and active forms. Pyrethrum compounds, though effective against the active forms killed few of the eggs or quiescent forms.

Marcovitch (S.). **Experimental Evidence on the Value of Strip Farming as a Method for the natural Control of injurious Insects with special Reference to Plant Lice.**—*J. econ. Ent.* **28** no. 1 pp. 62–70, 12 refs. Geneva, N.Y., February 1935.

An account is given of tests carried out in Tennessee to demonstrate that planting crops in strips instead of growing them in uniform blocks

increases the effectiveness of natural enemies of Aphids. In a plot in which turnips were planted in March, cucurbits, pulses, maize and cotton were sown during the following 2 months. Early in June the turnips were heavily infested by *Rhopalosiphum* (*Aphis*) *pseudobrassicae*, Davis, but by the end of the month natural enemies, chiefly *Hippodamia convergens*, Guér., had got the upper hand, although many of the plants had been destroyed. As a result of this heavy infestation of turnips, there were many parasites and predators in this plot, and the crops planted after the turnips were fairly free from Aphids. Plots of watermelons alone planted at the same time 120 and 250 yds. away were destroyed. On peas planted in isolated plots there were 493 individuals of *Macrosiphum onobrychis*, Boy. (*Illinoia pisi*, Kalt.) to a plant and 120 Coccinellids in a row, whereas on those grown among other crops there were only 27 Aphids and 20 Coccinellids. The predators, however, did not save the plants.

Some plants with a sticky surface, like tobacco and *Petunia*, tend to trap the parasites. Okra [*Hibiscus esculentus*] and cantaloupe melons growing near tobacco and *Petunia* were killed by *Aphis gossypii*, Glov., whereas these Aphids were controlled on okra growing elsewhere by *Lysiphlebus testaceipes*, Cress. Adults of this parasite placed in a vial with *Petunia* leaves became stuck to the leaves in an hour. Similarly, in an experiment with *Trichogramma minutum*, Riley, against *Protoparce sexta*, Joh., on tobacco, the adult parasites stuck to the glandular hairs of the tobacco. It is thought that this may explain why *Apanteles congregatus*, Say, also a parasite of *Protoparce*, is less numerous in tobacco than in tomato fields. The relative value of plants suitable for use in interplanting are discussed. In tests to find out how long Coccinellids can live on food other than insects, adults of *H. convergens*, *Coccinella novemnotata*, Hbst., and *Ceratomegilla* (*Megilla*) *maculata*, DeG., lived for 3–7 weeks on moulds, fungus spores and sweets.

Huber (L. L.) & Sleesman (J. P.). **Technique of Field Experimentation in Entomology. II. The Reduction of Data by the Method of Analysis of Variance.**—*J. econ. Ent.* **28** no. 1 pp. 70–76, 5 refs. Geneva, N.Y., February 1935.

This paper records the results of a test in Ohio to determine the differences in populations of *Hylemyia antiqua*, Mg., on 8 varieties of onion, so as to illustrate an experimental technique in which the sources of error are analysed and their significance calculated mathematically.

Bulger (J. W.). **A photoelectric Method for Measuring small Leaf Areas.**—*J. econ. Ent.* **28** no. 1 pp. 76–81, 4 figs. Geneva, N.Y., February 1935.

The following is the author's summary : A method is described for employing a photoelectric cell to measure the areas eaten by insects from poisoned leaf sandwiches $\frac{7}{8}$ inch in diameter. Although the results are not quite so accurate as those obtained with a polar planimeter, they can be obtained without the delay incidental to the photographic procedure.

Morofsky (W. F.). **A preliminary Survey of the Insect Fauna of some typical Michigan Trout Streams.**—*J. econ. Ent.* **28** no. 1 pp. 82–86. Geneva, N.Y., February 1935.

During 1933 and 1934 a study of the remains of insects in the stomachs of more than 800 trout and a survey of the principal trout streams of Central Michigan showed that trout of different species or sizes prefer different species of insects and that there is a relation between the number and kinds of insects in a given stream and the species of trout found there. Where a stream had been improved, there was a decided increase in insect population with a decrease in other animal life. A table shows the Orders and Families of insects found in the different types of streams.

Kinsey (A. C.). **The economic Importance of the Cynipidae.**—*J. econ. Ent.* **28** no. 1 pp. 86–91, 16 refs. Geneva, N.Y., February 1935.

Data from observations made over 17 years throughout the United States and Mexico showed that the economic importance of gall-making Cynipids of oak has been somewhat overestimated. Only the following species were observed to damage oak : *Andricus punctatus*, Basset, *A. cornigerus*, O.-S., *A. clavigerus*, Ashm., and *A. aquaticae*, Ashm., on many species of black oaks throughout the east of the United States, *Neuroterus batatus*, Fitch, on *Quercus alba*, in the north-east, *Andricus gemmarius*, Ashm., on black oaks in the east, *A. floridanus*, Ashm., on *Q. stellata*, *Q. margaretta*, etc., in the south-east, *A. perdens*, Kinsey, and *A. destructor*, Kinsey, on black oaks in the Pacific coast area, particularly in California, where stands have had to be replaced, and *Plagiotrochus suberi*, Weld., an introduced European species attacking European cork oak [*Quercus ilex* var. *suber*] in California. Only *A. floridanus* and *A. destructor* caused extensive infestations.

The only practicable control is to cut off the affected limbs. Each species is restricted to a single species of oak or to a small group of closely related species. Records of native Cynipids occurring in imported oaks have always been based on erroneous determinations. No attempt to force Cynipids to oviposit on any but their natural food-plants was successful. *P. suberi* is the only species of economic importance known to have been introduced into the United States. Since the country may be divided into five areas in which the kinds of oak are distinct, and since only about 1 per cent. of the gall-making Cynipids causes appreciable damage, infestations are never likely to be more than locally important.

Smith (F. F.). **Control Experiments on certain *Tarsonemus* Mites on Ornamentals.**—*J. econ. Ent.* **28** no. 1 pp. 91–98, 11 refs. Geneva, N.Y., February 1935.

Tarsonemus latus, Banks, and *T. pallidus*, Banks, attack a large number of plants in the United States [*R.A.E.*, A **22** 128]. They often occur together, and in association with one or more of five undescribed species of mites that appear to have saprozooic habits. As in experiments they only survived for a short time on the dead plant material upon which certain of these undescribed species live, it is believed that previous workers have failed to recognise the latter as distinct.

In tests, adults and larvae of *T. latus* were killed within an hour by any of several types of sulphur dust, and single applications of this material controlled infestations of several greenhouse plants. The adults, larvae and eggs were almost all killed by fumigation with calcium cyanide at rates of $\frac{3}{8}$ oz. and 1 oz. to 1,000 cu. ft. in a fumigation box and in greenhouses, respectively, but such high concentrations are not tolerated by certain plants. When fumigation took place at 56–65°F. the mortality was higher than at 66–80°F. Adults, individuals in the quiescent stage, and larvae were killed by vapourising naphthalene (2 oz. to 1,000 cu. ft.) in a fumigation chamber or by broadcasting naphthalene on the surface of the soil and covering the plant for 17 hours with a bell jar. *Tetranychus telarius*, L., was also killed in the tests.

Individuals of *T. pallidus* were not killed by sulphur vapour in 48 hours. Those that were directly exposed to sulphur dust died in 3 days, but those hidden in crevices of the plants were unaffected. In commercial tests 3 applications of sulphur did not control *T. pallidus* in greenhouses, whereas *T. latus* and *T. telarius* were completely destroyed. Moreover, it was not controlled by fumigation with calcium cyanide or naphthalene. Previous reports of successful control by these materials would appear to have been concerned with *T. latus* rather than *T. pallidus* [*cf. loc. cit.*]. *T. pallidus* was successfully controlled by immersing the plants in water at 108°F. for 20 minutes and immersion for 15 minutes in water at 110°F. controlled both *T. pallidus* and *T. latus*.

Proper cultural practices are very important in greenhouses, but where these fail, one or two applications of sulphur give the best control for *T. latus*, whereas immersion in hot water is best for *T. pallidus*.

Van Horn (M. C.). *Haltica ignita* **feeding on** *Fuchsia* **in the Greenhouse.**—*J. econ. Ent.* **28** no. 1 p. 98. Geneva, N.Y., February 1935.

Haltica ignita, Ill., was observed in Pennsylvania late in the summer of 1934 feeding on stock plants of one of four varieties of *Fuchsia* growing together. The plants were dusted with lead arsenate, and the infestation appeared to have been controlled, but larvae of the beetle were found on 8th January 1935 feeding on leaves of cuttings from the same variety in the greenhouse. The injury noticed on the stock plants, on which very few larvae were present, had been caused by adults before the date of examination. The chief injury, resulting in a loss of 40 per cent., was done to the cuttings. As many as 3 larvae fed on the lower surface of one leaf, and the leaves dropped before the cuttings were rooted.

Parrott (P. J.) & Collins (D. L.). **Some further Observations on the Influence of artificial Light upon Codling Moth Infestations.**—*J. econ. Ent.* **28** no. 1 pp. 99–103. Geneva, N.Y., February 1935.

Studies were made in New York State to determine the effect of light-traps on the adult and larval populations of *Cydia* (*Carpocapsa*) *pomonella*, L., and on the quality of the apples. The total number of moths captured during the summer of 1934 was 2,418, an average of

37·3 to a trap, as compared with a total of 8,942 moths, or an average of 225 to a trap, in 1933. Low temperatures during the winter had greatly reduced infestation. In 1933, 43·2 per cent. were females and in 1934, 44·16. In 1933, lead arsenate proved the best insecticide, and only this material was used in 1934 for comparison with light-traps. According to counts on bands, the number of caterpillars on unsprayed trees with light-traps was less than that on trees that had received 2 cover sprays but greater than that on trees that had received 4.

The percentage of damaged apples on unsprayed trees with light-traps lay between the percentages for trees receiving 3 and 2 cover sprays in 1933 and 4 and 3 cover sprays in 1934. The total injuries to fruit from unsprayed trees with lights and from trees that had received 4 cover sprays were about equal. In 1933, the average number of larvae per tree and the average percentage of injured apples were 0·39 and 9·7 on trees that had lights and were sprayed 4 times, whereas the corresponding figures for trees that had only been treated with 4 cover sprays were 4·41 and 52·01. On the controls there were 38·3 caterpillars and 96·2 per cent. of the apples were injured. Light traps, however, are too costly for general use.

Collins (D. L.) & Machado (W.). **Comments upon Phototropism in the Codling Moth with Reference to the Physiology of the compound Eyes.**—*J. econ. Ent.* **28** no. 1 pp. 103–106, 2 figs., 1 ref. Geneva, N.Y., February 1935.

A previous study showed that whenever *Cydia pomonella*, L., is active, the iris-pigment in the eyes of the moth is in motion [*R.A.E.*, A **23** 69]. Further work suggests that the bands of light that cause rapid movement of the iris-pigment lie in the near ultra-violet, violet and blue regions, and that of two light sources having the same continuous spectrum the more brilliant causes the iris-pigment to shift more quickly and is the more attractive.

Cutright (C. R.) & Morrison (H. E.). **Varietal Susceptibility to Codling Moth Injury.**—*J. econ. Ent.* **28** no. 1 pp. 107–109, 4 refs. Geneva, N.Y., February 1935.

The relative degree of susceptibility to infestation by *Cydia pomonella*, L., among eight varieties of 10-year-old apple trees was the subject of experiments in Ohio. All trees received calyx sprays of lead arsenate, and were then divided into 3 classes containing examples of each variety. The first were given further applications of lead arsenate, the second were treated with heavy lime with the addition of a sticker, and the third were left as a control. The data showed significant differences in infestation between certain of the varieties, the relative susceptibility of which remained the same for all treatments.

Harman (S. W.), Reed (T. W.) & Mack (G. L.). **The insecticidal Efficiency of various Nicotine Compounds for Control of the Codling Moth, 1934.**—*J. econ. Ent.* **28** no. 1 pp. 109–112, 1 fig. Geneva, N.Y., February 1935.

In western New York during 1934 fixed nicotine compounds were tested against the codling moth [*Cydia pomonella*, L.] on apples. Black leaf 155 [a commercial combination of nicotine sulphate and

bentonite] (5 lb. to 100 U.S. gals.) and Kolofog [bentonite-sulphur] (6 lb.) with the addition of ¾ U.S. pint nicotine sulphate, both used in 11 weekly applications, were slightly inferior to 6 applications of lead arsenate (6 lb. to 100 U.S. gals.). Five applications of Black leaf 155 (5 lb. to 100 U.S. gals.), when used throughout the summer, was much less efficient than the same number of lead arsenate sprays (3 lb.), although at this strength lead arsenate failed to give satisfactory control in severely infested orchards. Against the second brood larvae sprays containing 5 lb. bentonite or 1 per cent. oil together with 1 U.S. pint nicotine sulphate per 100 U.S. gals. were slightly better than an equal number of lead arsenate sprays (6 lb.). Three combination sprays of oil and nicotine sulphate were much better than three sprays of Black leaf 155. Spray mixtures such as oil-nicotine and bentonite-nicotine, following applications of lead arsenate, did little to reduce the lead arsenate residue.

Test spray solutions were made with varying amounts of bentonite mixed with nicotine sulphate (1 : 800). Bentonite remains suspended indefinitely in water, but with the addition of nicotine sulphate the finely divided clay particles appeared to coagulate and settled out on standing. This suspension was filtered out and the filtrate analysed for nicotine. This gave the soluble or unfixed nicotine, and so the fixed nicotine could then be determined. When nicotine sulphate was added to dry bentonite and then mixed with water, it settled out rapidly on standing. When it was added to bentonite already suspended in water, a flocculent precipitate formed immediately but settled out rather slowly. The spray used in the tests was made by the latter method. Chemical analysis showed that slightly greater amounts of nicotine were fixed by the dry-mix method. Bentonite-sulphur did not fix nicotine so well as plain bentonite. Analyses of sprayed fruit at different intervals after treatment show a rapidity in loss of nicotine that is probably one of the main objections to the use of these sprays. The greater amount of nicotine remains at the ends of the apple. Although they cannot at present replace lead arsenate, fixed nicotine compounds would be useful in late season applications, or on early varieties where there is need to avoid residues.

Cox (J. A.) & Daniel (D. M.). *Ascogaster carpocapsae* **Viereck in Relation to Arsenical Sprays.**—*J. econ. Ent.* **28** no. 1 pp. 113–120, 4 figs. Geneva, N.Y., February 1935.

The following is mainly taken from the authors' summary : Collection of over 100,000 larvae of the codling moth [*Cydia pomonella*, L.] from orchards of western New York during the past four years showed the average percentage of parasitism by *Ascogaster carpocapsae*, Vier., in unsprayed orchards to be more than twice that in sprayed orchards. The data were insufficient to show whether parasitism decreases in proportion to the number of sprays applied, whether the effect of sprays can be modified by timing and what is the ultimate result of the general use of chemically treated bands. In the laboratory female parasites caged with foliage sprayed with arsenicals only lived half as long and parasitised half as many eggs as those caged with clean foliage. Tests in which parasitised and normal larvae of *Cydia* were placed on apples sprayed with lead arsenate indicated that parasitised larvae are not more susceptible to arsenical poisoning than normal larvae and that low parasitism in sprayed orchards is not due to this factor.

MARSHALL (G. E.). **Preventing Spring Emergence of Codling Moths from inaccessible Places in Trees.**—*J. econ. Ent.* **28** no. 1 pp. 120–122. Geneva, N.Y., February 1935.

In experiments against overwintering larvae of the codling moth [*Cydia pomonella*, L.] all of a known number were killed by the following sprays: 1 U.S. pt. pineol soluble [*cf. R.A.E.*, A **17** 669, etc.] and 2 oz. alpha naphthylamine heated and diluted with 3 U.S. pts. water; 2 U.S. qts. water, ¼ lb. potash fish-oil soap (boiled together), 2 U.S. qts. Diamond paraffin oil added and the whole brought to the boil, then ½ lb. alpha naphthylamine added and the whole emulsified; and Milkol 4 parts with 6 parts of water.

Counts in heavily infested orchards show that birds, mice and other predators destroy nearly all the larvae overwintering on the tree trunks and larger branches. In laboratory and field tests in 1932 and 1934 to prevent emergence from crevices in the trees inaccessible to birds and the usual insecticides, mixtures of parawax (or alternatively of crank-case oil or tallow), alpha naphthylamine and hydrated lime [*cf. R.A.E.*, A **22** 693] were successful. The tallow mixture became powdery after a few months, but the other two were almost weatherproof and prevented the penetration of rain and decay. A test was made in 1934 with 116 old and badly split trees of one variety, which were treated early in spring with a mixture of parawax and alpha naphthylamine (2 : 1) heated together with the subsequent addition of hydrated lime. The material was still in place by August and no emergence had occurred.

Symposium on International Entomological Problems.—*J. econ. Ent.* **28** no. 1 pp. 123–142. Geneva, N.Y., February 1935.

The following papers are contained in this symposium: Co-operation between the United States and Canada in Entomological Problems, by A. Gibson (pp. 123–130), in which the chief insect pests common to both countries are briefly discussed; Plant Quarantine and Pest Control Problems common to Mexico and the United States, by A. Dampf (pp. 131–138), which deals mainly with *Platyedra* (*Pectinophora*) *gossypiella*, Saund., and *Anastrepha* spp., the two chief insect pests along the Mexican border; and International Entomological Problems, by L. A. Strong (pp. 139–142), who gives examples of international co-operation in eradication problems and suggests the value of international co-ordination in research and in the application of quarantine restrictions.

BIGGER (J. H.). **Preliminary Field Tests of Oil Bait for Cutworm Control.**—*J. econ. Ent.* **28** no. 1 p. 130. Geneva, N.Y., February 1935.

A bait of bran and lubricating oil (viscosity S.A.E. 30) [*cf. R.A.E.*, A **22** 277] mixed with white arsenic, Paris green or sodium fluosilicate controlled Lepidopterous larvae in field trials in Ohio, where a severe outbreak occurred on lucerne seedlings in September 1934. The species were *Cirphis unipuncta*, Haw., *Laphygma frugiperda*, S. & A., *Prodenia ornithogalli*, Gn., *Heliothis obsoleta*, F., *Colias* (*Eurymus*) *eurytheme*, Boisd., and *Phytometra* (*Autographa*) *californica*, Speyer.

MIDDLETON (W.), BUCHANAN (W. D.), MAY (C.) & WALTER (J. M.). *Ceratostomella* (*Graphium*) *ulmi*, **the Cause of the Dutch Elm Disease, transmitted by** *Scolytus multistriatus*.—*J. econ. Ent.* **28** no. 1 p. 138. Geneva, N.Y., February 1935.

In carefully controlled laboratory experiments in New Jersey, direct transfer of *Ceratostomella ulmi* resulting in infection was secured by caging individuals of *Scolytus multistriatus*, Marsh., that had emerged from diseased wood, upon healthy young elms protected in the greenhouse. Regardless of the part possibly played by mites present on the beetles [*cf. R.A.E.*, A **22** 649], the results are considered proof that adults of *S. multistriatus* carried *C. ulmi* from the diseased elm in which they matured to healthy trees on which they fed.

LIST (G. M.). **An easily cleaned and efficient Dust Mixer.**—*J. econ. Ent.* **28** no. 1 p. 142. Geneva, N.Y., February 1935.

An ordinary milk can was found efficient for mixing experimental quantities of insecticide dusts. Two plates with spindles about 3½ inches long were riveted on either side of the can about midway between the top and bottom. The can, with a crank attached to the end of one of the spindles, was placed on a light iron rack so that it rotated end over end, and was used as the ordinary ball mill type of mixer. A rubber band fixed inside the lid prevents loss of dust.

TURNER (N.). **Effect of Mexican Bean Beetle Injury on Crop Yield.**—*J. econ. Ent.* **28** no. 1 pp. 147–149, 1 ref. Geneva, N.Y., February 1935.

During work in Connecticut on the control of *Epilachna corrupta*, Muls., by cultural measures, an experiment on the spacing of bean plants, a preliminary report of which has been noticed [*R.A.E.*, A **21** 238], was continued on two plantings in 1933 and on one in 1934. On plants 8 inches apart, 25·7 per cent. of the pods were injured and the yield was reduced by 11·3 per cent., as compared with 44·9 and 22·6 per cent. among plants 2 inches apart. Both the size and number of pods was reduced. The pods of plants set 2 inches apart were badly injured but the damage grew less as the space was increased.

Beans planted during the first half of June were least affected by *E. corrupta*, and beans planted during the first half of July suffered most.

MACLEOD (G. F.) & MAUGHAN (F. B.). **Some Factors involved in Measuring Results of Experiments with Onion Thrips.**—*J. econ. Ent.* **28** no. 1 pp. 150–153, 3 figs. Geneva, N.Y., February 1935.

Data from a series of experiments with dusts of naphthalene, naphthalene and pyrethrum, and nicotine in the control of the onion thrips [*Thrips tabaci*, Lind.] carried out in New York State are used to illustrate the way to interpret field results. The experiments were laid out and the data collected so as to compensate for such variables as differences in soil, wind currents, surrounding flora, influence of one treatment upon the other because of dust-drift, and the mechanics of planting operations. Variations in yield of onions, of which the principal cause is probably differences between soils, were much greater than variations in the number of thrips. On the untreated plots where

there were 120 thrips or more to a plant, the yields were diminished, but where there were less than 30 thrips on each treated plant the yield did not decrease with a further decline in the number of the thrips. All the treated plots produced significantly more bushels of onions to the acre than the untreated plots, but no one treatment gave a significantly higher yield than the others.

Wilcoxon (F.) & Hartzell (A.). **Further Experiments on Organic Thiocyanates as Insecticides (Abstract).**—*J. econ. Ent.* **28** no. 1 p. 153. Geneva, N.Y., February 1935.

Five closely related organic thiocyanates were synthesised and their insecticidal properties compared with that of γ-thiocyanopropyl phenyl ether [*cf. R.A.E.*, A **22** 697]. Of these compounds, trimethylene dithiocyanate was much better than the latter, but the others were not nearly so good. Trimethylene dithiocyanate was considerably more toxic than its isomer, propylene dithiocyanate. In laboratory tests trimethylene dithiocyanate satisfactorily controlled *Aphis rumicis*, L., *A. gossypii*, Glov., *Pseudococcus citri*, Risso, *P. adonidum*, L., *Scolytus multistriatus*, Marsh., *Epitrix cucumeris*, Harr., and *Tetranychus telarius*, L. Of 75 species and varieties of plants, 64 tolerated trimethylene dithiocyanate (0·1 per cent.) but only 59 tolerated γ-thiocyanopropyl phenyl ether at the same concentration.

Fox (H.). **Some Misconceptions regarding the Effects of the Cold of February 1934 on the Larvae of the Japanese Beetle, *Popillia japonica* Newman.**—*J. econ. Ent.* **28** no. 1 pp. 154–159, 5 refs. Geneva, N.Y., February 1935.

The following is substantially the author's summary: Although there is some ground for the view that severe winters are likely to destroy many larvae of *Popillia japonica*, Newm., or possibly to exterminate it, the conditions during February 1934 in areas of the United States generally infested by it were not so extreme as to bring the temperature of the soil at depths where larvae usually are to the lethal point of approximately 15°F. In the region where the beetle is widely distributed, a heavy blanket of snow kept the temperature of the soil well above lethal point, whereas in other places where its distribution is only local, larval mortality was not unusually heavy because intervals of warmer weather stopped the temperature of the soil from falling to the lethal point. The popular explanation that the larvae burrowed deeper than in normal winters is not consonant with what is known of their habits.

Driggers (B. F.) & Pepper (B. B.). **Further Experiments with fixed Nicotine Compounds in Codling Moth Control.**—*J. econ. Ent.* **28** no. 1 pp. 162–171, 2 refs. Geneva, N.Y., February 1935.

Further experiments [*cf. R.A.E.*, A **22** 293, 407] in the control of the codling moth [*Cydia pomonella*, L.] by fixed nicotine compounds were carried out in New Jersey in 1934. The following is mainly taken from the authors' summary and conclusions: In that area of New Jersey where the codling moth produces 2 annual broods, 12 spray combinations were each tested on 2 varieties of apple. All plots received 4 cover sprays for the first brood during June and 5 for the second during

July and August. Nine combinations of fixed nicotine compounds were tested in comparison with lead arsenate (3 lb. per 100 U.S. gals.) and lead arsenate with summer oil. Against the larvae of the first brood nicotine tannate with bentonite sulphur, nicotine sulphate with bentonite sulphur, and lead arsenate with summer oil gave the best results. Injury by the second brood was very severe on plots treated with Black Leaf 155 [nicotine sulphate and bentonite], the least effective of the fixed nicotine compounds, and with nicotine tannate and bentonite sulphur at half strength. At the end of the season nicotine sulphate with bentonite sulphur and lead arsenate with summer oil had produced the best results. The standard lead arsenate treatment, with the addition in 3 of the first brood sprays of ½ U.S. pint nicotine sulphate and 6 lb. bentonite sulphur to 100 U.S. gals., was also good. Nicotine tannate carrying bentonite or bentonite sulphur was slightly less effective. The number of larvae collected weekly throughout the season from 3 trees in each plot support, in the main, the conclusions drawn from the examination of the fruit. In plots where the control was poor, the nicotine deposit on fruit and foliage was low immediately after spraying and disappeared almost entirely during the 10-day intervals between spraying.

After 10 days there was 4 times as much nicotine on the foliage of a plot treated with tank-mixed nicotine bentonite as on one treated with a processed spray. There were significantly fewer leaves missing from plots sprayed with nicotine than from plots sprayed with lead arsenate, and none of the remaining leaves on the former were badly injured whereas on the latter about one-third of them were severely scorched.

HEADLEE (T. J.). **Research Needs of Codling Moth Control.**—*J. econ. Ent.* **28** no. 1 pp. 172–176, 14 refs. Geneva, N.Y., February 1935.

The development of studies on the bionomics and control of the codling moth [*Cydia pomonella*, L.] in the United States is briefly reviewed from the literature from 1898 onwards, and unsolved problems are indicated.

STEARNS (L. A.). **Comments concerning Codling Moth Control in Delaware.**—*J. econ. Ent.* **28** no. 1 pp. 176–182, 4 figs., 1 ref. Geneva, N.Y., February 1935.

Comparative data for 1930–1934 are recorded on the early seasonal development of the codling moth [*Cydia pomonella*, L.] and on certain peculiarities of control measures under the conditions in Delaware [*cf. R.A.E.*, A **22** 290]. Emergence of the overwintered brood occurred between 29th April and 23rd June, reaching its maximum on 20th–21st May. Early seasonal development varied little from year to year. According to experimental work during the past 5 years, lead arsenate is better than any of its substitutes. The general spraying programme in 1934 included a petal fall and 6 cover sprays. Summer oil in the second or subsequent cover sprays increased their efficiency. The examination of burlap bands showed a significant relation between the amount of fruit on a given tree and the number of larvae maturing on it, irrespective of spray treatment. This factor must be taken into consideration in recording and evaluating control data.

Schoene (W. J.) & Jefferson (R. N.). **Tests of Contact Insecticides on the Eggs of the Peach Moth and the Codling Moth.**—*J. econ. Ent.* **28** no. 1 pp. 182–184, 1 ref. Geneva, N.Y., February 1935.

In tests between June and September 1934 in Virginia, the codling moth [*Cydia pomonella*, L.] and the peach moth [*C. molesta*, Busck] were induced to lay eggs on sheets of glass, which were so arranged that they carried eggs of known ages. It was therefore possible to treat eggs of different ages with the same spray at the same time. As observations of untreated eggs showed considerable variation in fertility, some tests were carried out with fertile eggs only. Any effective insecticide killed eggs in all stages of development, but an insecticide that was not strong enough to kill all eggs usually acted irregularly. Orthol K appeared to be the more effective of the two proprietary oil sprays used. Nicotine sulphate (1 : 800) with Orthol K ($\frac{3}{4}$ per cent.) and Orthol K ($1\frac{1}{4}$ per cent.) alone killed all the eggs of both species. The eggs of *C. molesta* were killed by nicotine sulphate (1 : 1200) with Orthol K ($\frac{3}{4}$ per cent.). A table shows the percentages of eggs of different ages killed by less effective insecticides.

Chapman (P. J.). **The Codling Moth Control Problem in Districts infested with Apple Maggot.**—*J. econ. Ent.* **28** no. 1 pp. 184–187. Geneva, N.Y., February 1935.

In eastern New York, where 3 lead arsenate cover sprays in June and July generally suffice to keep losses from the codling moth and apple maggot [*Cydia pomonella*, L., and *Rhagoletis pomonella*, Walsh] down to 5 per cent. of the apple crop, residues are often excessive, and shortening the schedule involves heavy loss. *Rhagoletis* was not controlled in 1933 with nicotine tannate or with nicotine sulphate and soap as substitutes for lead arsenate, or in 1934 with nicotine sulphate and bentonite or with nicotine sulphate and bentonite sulphur applied at 10-day intervals during adult emergence. Nicotine preparations applied at intervals of 2–3 weeks gave poor results against *C. pomonella*. The danger of foliage injury has been the chief factor limiting the use of calcium arsenate [*R.A.E.*, A **22** 406] which is about as good as lead arsenate against *R. pomonella*. According to experiments during 1931–34 calcium arsenate, although inferior to lead arsenate, gives commercial control of *C. pomonella* under the conditions prevailing in eastern New York. Since there has been some progress in manufacturing calcium arsenate that does not excessively injure the foliage, the author thinks that it might be used temporarily, to avoid the necessity of washing sprayed fruit.

Harman (S. W.). **How we met the Codling Moth Situation in western New York in 1934.**—*J. econ. Ent.* **28** no. 1 pp. 187–189. Geneva, N.Y., February 1935.

Details are given of schedules (differing with the degree of infestation) for spraying with lead arsenate and lead arsenate and oil against the codling moth [*Cydia pomonella*, L.] on apples in western New York.

Of various schedules of lead arsenate and lead arsenate and oil tried on an experimental plot, the best was 6 applications of lead arsenate (6 lb. to 100 U.S. gals.). The residue was ·110 grains As_2O_3 and ·254 Pb, but $1\frac{1}{2}$ per cent. hydrochloric acid and Vatsol in the commercial brush type of washer reduced it below tolerance.

Menusan, jr. (H.). **Size of Plot and its Relationship to Field Spraying Experiments with Potatoes.**—*J. econ. Ent.* **28** no. 1 pp. 190–192, 3 refs. Geneva, N.Y., February 1935.

The following is the author's summary : Some of the sources of error involved in determining the yield of potatoes in field experiments are discussed. The standard deviation of a single plot decreased as the size of the plot increased. This decrease in deviation was not proportional to the increase in area of the plot. The smallest plots, ·002 to ·003 acres, were the most efficient considering the land and labour involved. On a unit basis it is shown that about 80 plants are required in any one treatment to measure 10 per cent. differences in yield.

MacLeod (G. F.) & Rawlins (W. A.). **A comparative Study of Wireworms in Relation to Potato Tuber Injury.**—*J. econ. Ent.* **28** no. 1 pp. 192–195, 1 fig. Geneva, N.Y., February 1935.

This paper presents quantitative data on wireworms obtained by the inspection of 18 potato fields in two counties of western New York after the vines had died down. Tubers in the lower parts of the field were 3–4 times as badly injured as those in the higher, and the two most abundant wireworms, *Agriotes mancus*, Say, and *Pheletes* (*Limonius*) *ectypus*, Say, especially the former, were most numerous in the lower areas. *Melanotus communis*, Gyll., which was third in abundance, occurred in numbers only in 3 fields. Other species were of little importance. Adults of *A. mancus* normally select shaded moist areas for oviposition, and such a preference may account for the larger numbers of both the injurious species in the lower parts of the fields.

Regardless of species, injury was invariably more frequent in low areas than on knolls and ridges even when the numbers of larvae were the same. *A. mancus* is the most destructive, and *M. communis* is more harmful to potatoes than *P. ectypus*. The injury caused by *A. mancus* was proportionate to the numbers of larvae, whereas in the other two species this correlation was not so obvious. Where from 3 to 9 larvae of *P. ectypus* were present on one hill there were several cases in which no injury was done, whereas the plants were invariably damaged whenever there were more than 2 larvae of *A. mancus*. Where there were less than 4 tubers to a hill, the proportion of injured potatoes increased more rapidly for any given number of wireworms than where 4 or more tubers occurred. The number of entrance holes made in tubers was in proportion to the number of wireworms, but there was no such direct relation between the number of wireworms and the number of injured tubers.

Frost (S. W.). **Notes on Summer Contact Sprays for Peach.**—*J. econ. Ent.* **28** no. 1 pp. 196–197. Geneva, N.Y., February 1935.

In tests of summer sprays for peach in Pennsylvania, 2 per cent. oil emulsions have been used on different varieties for 4 and 5 consecutive seasons with no apparent injury, even when applied 10 days after sulphur. Against Tetranychid mites, nicotine sulphate (1 : 800) was not very effective, but summer oil emulsions at 1 and 2 per cent. gave 96·2 and 99·5 mortality, respectively. Of the soaps tested (at the rate of 1 lb. per 100 U.S. gals.), corn oil gave 92·3 per cent. mortality, coconut

oil 97·2, and linseed oil only 47·4. None of these materials, even at higher concentrations, caused injury. Two per cent. summer oil emulsion with 3 lb. basic lead arsenate and 10 lb. bentonite sulphur per 100 U.S. gals. gave negative results against the oriental fruit moth [*Cydia molesta*, Busck]. This spray caused no injury to peach trees.

DIRKS (C. O.). **Larval Production and Adult Emergence of the Apple Fruit Fly in Relation to Apple Varieties.**—*J. econ. Ent.* **28** no. 1 pp. 198–203, 3 figs., 8 refs. Geneva, N.Y., February 1935.

Further data presented from the results obtained in studies of the biology of *Rhagoletis pomonella*, Walsh, carried out during the past 3 years in Maine [*cf. R.A.E.*, A **20** 517 ; **21** 330, 331], deal with larval production and emergence in relation to summer, autumn and winter varieties of apple, adult emergence according to year of life-cycle and variety of apple, the period of adult emergence, and the proportion of the sexes among early and late emerging flies.

GARMAN (P.) & BRIGHAM (W. T.). **Further Notes on Breeding *Macrocentrus ancylivorus* on Larvae of the Oriental Fruit Moth.**—*J. econ. Ent.* **28** no. 1 pp. 204–205, 1 ref. Geneva, N.Y., February 1935.

Studies, subsequent to those already noticed [*R.A.E.*, A **22** 316], on breeding *Macrocentrus ancylivorus*, Rohw., a parasite of *Cydia molesta*, Busck, deal with the effect of the age of the host larvae on the number of parasites finally reared, on the average percentage of parasitism and on the sex ratio. In the experiments the host larvae were reared from eggs laid on sliced green apples. The slices were kept at 80°F. for 4, 5 and 6 days before being offered to the parasites for oviposition. After these periods, the host larvae would be in the second and third instars, mainly in the third instar and in the third to fifth instar, respectively. In two parallel experiments with varying numbers of eggs, it was found that the ratio of eggs of *C. molesta* to the number of parasites reared was 14·4 : 1 and 12·3 : 1 for 4-day larvae, 8·7 : 1 and 8·8 : 1 for 5-day larvae, and 5·7 : 1 and 6·2 : 1 for 6-day larvae. Corresponding figures for the number of *M. ancylivorus* reared per female were 7·2, 2·7 ; 10·5, 5·4 ; 10·2, 7·8 ; for the percentage of parasitism 22·6, 22·1 ; 36, 27·5 ; 41·6, 46, and for the percentage of males 38·0, 48·5 ; 46·5, 49 ; 34·6, 61·9. The percentage of parasitism is therefore higher among older larvae, but the actual parasitism depends in part upon the number of larvae presented, a number that cannot be accurately estimated if this technique is used. By doubling the number of host eggs, the number of parasites was approximately doubled.

As the result of the information obtained, production of *M. ancylivorus* was so increased that 41,000 parasites were reared between 1st January and 31st August 1934, and about 24,000 were liberated in orchards in Connecticut during the summer. The cages used in the experiments were 14-inch cubes placed in sand and covered with muslin. Temperature in the room during tests averaged 74°F. and the average relative humidity was about 60 per cent. Within the cages humidity averaged 67 per cent. under similar conditions. Light came at night from 25-watt daylight bulbs above the cages, and the illumination was about 10 foot candles during the day.

Glasgow (H.). **Substitutes for Lead Arsenate in Cherry Fruit Fly Control.**—*J. econ. Ent.* **28** no. 1 pp. 205–207. Geneva, N.Y., February 1935.

Residues from lead arsenate against the cherry fruit flies [*Rhagoletis cingulata*, Lw., and *R. fausta*, O.-S.] on sour cherry in New York may be removed by ordinary washing when the cherries are intended for tinning, but this cannot be done if part of the crop is to be used fresh. In well-cared-for commercial orchards 1 lb. lead arsenate, with a corresponding reduction in the residue, has given a degree of control almost equal to the standard rate of 3 lb. to 100 U.S. gals. It has been found better to reduce the dosage of lead arsenate progressively from 4–5 lb. to $\frac{1}{2}$–$\frac{3}{4}$ lb. as the season advances and the fruit approaches maturity than to reduce it uniformly in all sprays. Even so the residue is sometimes too great, and various substitutes for lead arsenate have been tried for several years. Calcium arsenate has proved almost or quite as effective, avoids the problem of lead residues and is more quickly washed off the fruit by rain than lead arsenate. Barium fluosilicate and cryolite, which in some cases gave better control than lead arsenate, have been used with success, but fluorine compounds also leave objectionable residues. Experiment showed that fixed nicotine preparations are inferior to either arsenicals or fluorine compounds. In one orchard infestation fell from about 30 per cent. in 1933 to less than 1 per cent. in 1934 when 3 sprays of 2 lb. derris powder (rotenone 4 per cent.) to 100 U.S. gals. water had been applied during the oviposition period.

Langford (G. S.) & McConnell (H. S.). **Biology of *Tomostethus multicinctus* (Roh.), a Sawfly attacking Ash.**—*J. econ. Ent.* **28** no. 1 pp. 208–210, 1 fig., 3 refs. Geneva, N.Y., February 1935.

An account is given of the results of a study during 1933 and 1934 on the bionomics of *Tomostethus multicinctus*, Rohw., which has been observed to defoliate white ash (*Fraxinus americana*) in Maryland and also occurs on California privet and Japanese honeysuckle. It has one generation a year and hibernates as a pre-pupa in an earthen cell. The length of the pupal period averages 16 days, and the adults usually appear when the leaf buds first begin to show green in the latter half of April and begin to disappear after the first week in May. A female contains 30–58 fully developed eggs. They are deposited in early May beneath the tissue along the outer margin of the leaflets, and as a result the leaflets are often deformed. As many as 42 eggs to a leaf have been counted. The incubation period lasts 6–8 days. The larvae are full-fed in 10–12 days, and by the last week of May most of them have entered the ground to construct the pupal cells. Trees have been completely defoliated in 5 days.

Two Ichneumonids attack *T. multicinctus*. One emerges about the same time as its host and oviposits in its eggs, although the host is not killed until after it enters the ground. The other, which belongs to the genus *Pezoporus*, emerges about the time the sawfly larvae have finished feeding and apparently attacks them in the soil. Applications of arsenicals made over a period of several years have always been effective in controlling the sawfly, which is also attacked by *Pediculoides ventricosus*, Newp., and fungous diseases.

ROARK (R. C.). **Advantages and Limitations of organic Insecticides.**—*J. econ. Ent.* **28** no. 1 pp. 211–215, 7 refs. Geneva, N.Y., February 1935.

The following is substantially the author's summary: The ideal insecticide should be toxic to insects at an economical dosage, it should not be injurious to plants, and it should not leave a residue on foodstuffs that is toxic to man or domestic animals. Such a material is more likely to be found among organic than among inorganic compounds. Certain organic insecticides, such as the pyrethrins and rotenone, are more toxic than inorganic insecticides to certain insects, do not injure the most delicate vegetation and have no acute toxic action on the higher animals. On the other hand, the pyrethrins and rotenone are highly specific in their insecticidal action and many insects are not controlled by them, they are costly, and they decompose too rapidly for some uses when exposed to light and air or placed in the soil. The same objections apply to most other organic insecticides. Research should be devoted to cheapening and stabilising known organic insecticides as well as to discovering new ones.

Organic compounds for use as insecticides may be sought among animals and plants and also among the products of extinct animal or vegetable life such as natural gas, petroleum, coal and shale oil. Synthetic materials should also be tested. The field for research is immense but the number of products satisfying the requirements may be expected to be very small. Certain toxophoric groups are known but the study of the relation between toxicity and chemical structure is in its infancy. The specificity of organic insecticides necessitates the development of many different classes of compounds to combat the numerous classes of insects.

TISCHLER (N.). **Studies on how Derris kills Insects.**—*J. econ. Ent.* **28** no. 1 pp. 215–220, 2 figs. Geneva, N.Y., February 1935.

Conclusions from investigations on the physiological effect of derris on insects are summarised, and evidence for them is briefly presented. To produce toxic effects derris must penetrate into the insect body. Many insects to which neither sprays nor dusts are toxic are susceptible to it when an aqueous extract is injected into the blood stream. Derris extract enters the insect body through the alimentary canal, through the spiracles and tracheal system and through the external integument. Derris powder enters by way of the alimentary canal, but hardly at all by way of the tracheal system. There is also evidence that the powder is extracted by water of the body exudates and of body fluids and so enters through the integument; a theoretical explanation of this process is given. Experiments in which bees were exposed to a stream of air passing over derris powder and derris extracts respectively and in which bees were exposed to the built-up vapours of these materials in a container confirmed the findings of other investigators that derris does not emit a toxic vapour [but *cf.* **23** 295].

Experiments with frogs and insects indicated that the effect of derris on muscles and nervous reflexes and on the heart and circulation is probably secondary, its primary action being to derange the respiratory function and inhibit the ability of the animal to utilise oxygen. It therefore appears to be general rather than specific to any organ or system.

Swingle (M. C.) & Cooper (J. F.). **Toxicity of Fixed-Nicotine Preparations to certain Lepidopterous Pests of Truck Crops.**—*J. econ. Ent.* **28** no. 1 pp. 220–224. Geneva, N.Y., February 1935.

The following is the authors' summary : Six substances containing nicotine in relatively insoluble and non-volatile form and water-soluble nicotine bitartrate were tested in the laboratory against the first instar of 5 species of Lepidopterous larvae. *Xylomyges* (*Prodenia*) *eridania*, Cram., and *Phlyctaenia rubigalis*, Gn., were much more resistant to fixed-nicotine preparations than were *Pieris* (*Ascia*) *rapae*, L., *Plutella maculipennis*, Curt., and *Lycophotia infecta*, Ochs. Nicotine silicotungstate was effective against all species except *P. rubigalis*. The 3 commercial nicotine preparations tested were nearly as effective as nicotine silicotungstate against *P. rapae*, *P. maculipennis*, and *L. infecta*. Dimethyl nicotinium sulfate-bentonite was relatively ineffective against all 5 species.

Ginsburg (J. M.). **New Wetting Agents for Old Insecticides.**—*J. econ. Ent.* **28** no. 1 pp. 224–228, 15 refs. Geneva, N.Y., February 1935.

The following is mainly taken from the author's summary : Experiments were conducted with several new sulphated compounds (classified as sulphated fatty alcohols, sulphated fatty acids and sulphated phenol compounds) in order to determine their possible value as spreading and wetting agents with contact insecticides. The results indicate that they spread on waxy foliage such as that of nasturtium and cabbage at dilutions of from 1 in 200 to 1 in 2,000, possess valuable emulsifying properties and are not dangerously toxic to foliage. They may be used with hard water and sea water and are physically compatible with lime-sulphur, nicotine, pyrethrum and derris sprays. They are to some extent toxic to Aphids and mosquito larvae.

Burdette (R. C.). **Derris Dusts and Oil-Lead Arsenate Spray for Squash Vine Borer** (*M. satyriniformis* **Hbn.**).—*J. econ. Ent.* **28** no. 1 pp. 229–231, 3 refs. Geneva, N.Y., February 1935.

Unsuccessful work against *Melittia satyriniformis*, Hb., on squash in New Jersey in 1930–32 is briefly reviewed. In 1934, experiments with insecticides (3 applications made on 10th, 18th and 27th July) gave the following percentages of uninfested squash vines : derris and talc (25 : 75) 88·3 ; derris, sulphur, clay (20 : 25 : 55) 82·4 ; a commercial combination of pyrethrum extract, derris and carrier 66·1, and 1 U.S. gal. oil, 3 lb. lead arsenate and 100 U.S. gals. water 73, as compared with 48·1 per cent. of the untreated vines. By October, the squashes on the treated plots were more numerous and heavier than on the untreated. The best results were on the plot treated with the derris-sulphur-clay, which gave an increase of 74·5 per cent. in weight over the check plot. The amount of dust for 3 applications varied from 55 to 65 lb. to an acre.

Felt (E. P.). **Bark Beetles and the Dutch Elm Disease.**—*J. econ. Ent.* **28** no. 1 pp. 231–236, 2 refs. Geneva, N.Y., February 1935.

The author believes that *Scolytus multistriatus*, Marsh., the relation of which to Dutch elm disease [caused by *Ceratostomella ulmi*] in the

United States is briefly discussed, limits its attacks almost, if not quite exclusively, to sickly and dying trees or parts of trees. It appears to be absent in parts of Ohio where the disease has been eradicated, but is abundant in northern New Jersey, where in spite of similar control measures since 1933, more than 7,000 infected trees have been found. In New Jersey the number of trees known to be diseased has increased nearly twenty-fold during the 12 months ending August 1934, and the area of infestation is three times as large as at the beginning of the year. The author considers the possibility that other Scolytids may also carry the disease [*cf.* **22** 652], and discusses the distance for which adults of *S. multistriatus* may be able to fly and the extent to which drifting on the wind might increase their range of flight. In view of the data that he has collected he suggests that the 10-mile belt at present fixed as defining the probable maximum yearly spread of *S. multistriatus* more nearly represents the minimum. The only promising control method is to reduce the production of beetle carriers by felling and burning all dead, sickly and dying trees.

Ginsburg (J. M.), Schmitt (J. B.) & Granett (P.). **Utilization of a completely refined, low-boiling Petroleum Distillate in controlling Insects infesting Chrysanthemum and other Plants.**—*J. econ. Ent.* **28** no. 1 pp. 236–242, 1 fig., 3 refs. Geneva, N.Y., February 1935.

In New Jersey a large number of greenhouse plants infested with several species of insects were sprayed with the completely refined petroleum distillate already noticed [*R.A.E.*, A **23** 178]. It was applied undiluted through 3 different types of sprayers. It is very volatile and penetrates plant and insect tissues. Several thousand young chrysanthemum plants remained undamaged even after immersion in the oil [*cf. loc. cit.*], but sprays applied with any but the finest type of sprayer injured many delicate species of plants. The following percentages of various pests were killed without injury to the plants by very fine sprays of this oil with the addition of pyrethrum extract equivalent to $\frac{1}{2}$ lb. flowers to 1 U.S. gal.: *Tetranychus telarius*, L., on carnation and bean (99), *Thrips tabaci*, Lind., on nasturtium (100), *Hercothrips* (*Heliothrips*) *fasciatus*, Perg., on bean (98), and *Pseudococcus comstocki*, Kuw., on tobacco (100), and on mulberry (92), all within 24 hours of spraying; and *Chrysomphalus dictyospermi*, Morg., on palm (90–110), *Trialeurodes* (*Aleurodes*) *vaporarium*, Westw., on apple (100), *Macrosiphum sanborni*, Gill., and *Rhopalosiphum rufomaculatum*, Wilson, on chrysanthemum (100), and *Malacosoma americana*, F., on apple (100), all within 48 hours. Injury to the foliage of plants more delicate than chrysanthemum may be eliminated by using fog sprayers. The addition of extract of pyrethrum improves the control. Spraying should be done on sunny days when the humidity is low, so that the oil will soon volatilise from the plant tissue. Spraying blossoms and highly developed flower buds might cause permanent injury.

Pepper (J. H.) & Strand (A. L.). **The Importance of Surface Temperatures in Heat Sterilization.**—*J. econ. Ent.* **28** no. 1 pp. 242–244, 1 graph. Geneva, N.Y., February 1935.

During sterilisation of large buildings by heat the lowest temperatures are found at the surface of concrete floors because of the stratification of heated air. In an experiment, a block of concrete 4 ft. square

and 10 inches thick, on and above the surface of which thermocouples had been placed, formed the floor of a cubical compartment made of celotex. All wires from the thermocouples led through the block to the potentiometer. The chamber was heated by an electrical system that provided for adequate circulation of air.

The fatal high temperature for *Tribolium confusum*, Duv., which is assumed to be 120°F., was reached at the surface of the floor in about 8 hours, at $\frac{3}{4}$ inch above the surface in 4 hours, and at $\frac{1}{2}$ inch above in 2 hours. Temperatures 1–2 inches above the floor showed very little difference from those $\frac{1}{2}$ inch above. The greatest height of adults of *T. confusum* ranged from ·015 to ·023 inch when placed on a cool surface and ·023 to ·031 inch on a heated surface, so that they are considerably below any point the temperature of which can be measured with an ordinary mercury thermometer. The importance of keeping up the temperature for several hours after 120°F. is recorded by thermometers lying on the floor is therefore obvious.

BUTLER (H. G.). **Methods of determining the Degree of Parasitization of Twig-infesting Oriental Fruit Moth Larvae.**—*J. econ. Ent.* **28** no. 1 pp. 244–246, 4 refs. Geneva, N.Y., February 1935.

The author explains different methods used in Tennessee during 1931–33 to determine, from twigs of peach collected in the field, the degree to which *Macrocentrus delicatus*, Cress., parasitises *Cydia* (*Grapholitha*) *molesta*, Busck. [*R.A.E.*, A **21** 94, 657]. Since *Macrocentrus* parasitises larvae in all stages of development, it is misleading to base figures on counts of parasitised larvae in collected twigs, because exposure to the parasite ceases when the twig is collected. It was found best to base the percentages on the number of moths and parasites that matured within 5 days of collection.

THOMAS (C. A.). **A Method for Protecting Mushroom Grain Spawn against Springtails and certain other Mushroom Pests.**—*J. econ. Ent.* **28** no. 1 p. 247. Geneva, N.Y., February 1935.

A powder containing 6 per cent. nicotine mixed with fully grown mushroom grain spawn just before it is sent out to the growers has been found to stop springtails from feeding until the mycelium has grown out into the surrounding manure, after which damage to the spawn piece is unimportant. The mycelium was not injured and even seemed to be stimulated. The spawn should be planted within two days of treatment. Treated spawn seems to be less attractive to rats and mice.

BIGGER (J. H.). **Third Brood Chinch Bugs observed in Illinois for the First Time.**—*J. econ. Ent.* **28** no. 1 p. 247. Geneva, N.Y., February 1935.

During September and October 1934, beginning at least a month after practically the whole second generation of *Blissus leucopterus*, Say, had completed its growth, large numbers of first and second instar nymphs of a third generation were observed for the first time in Illinois. They occurred on grasses and self-sown oats in several localities.

YOTHERS (M. A.), ALLEN, jr. (P. B.) & SCHEFFER (P. M.). **High Percentage of Parasitization of Codling Moth Eggs by** *Trichogramma minutum*, **Riley, in Wenatchee, Washington, District.**—*J. econ. Ent.* **28** no. 1 pp. 247–248, 1 ref. Geneva, N.Y., February 1935.

In north-central Washington in July and August 1934, as many as 80–84 per cent. of the eggs of the codling moth [*Cydia pomonella*, L.] were naturally parasitised by *Trichogramma minutum*, Riley, which had not previously been recorded from the codling moth in this area, though it occurs there in other hosts. The percentage of parasitism, which increased as the season advanced, was highest in unsprayed or neglected orchards where infestation by *C. pomonella* was greatest; in well-cared-for orchards there were few or no parasites.

RITCHER (P. O.) & FLUKE, jr. (C. L.). *Exoprosopa fasciata* **Macq., White Grub Pupal Parasite.**—*J. econ. Ent.* **28** no. 1 p. 248. Geneva, N.Y., February 1935.

Of 27 larvae of *Exoprosopa fasciata*, Macq., parasitising pupae of *Lachnosterna* (*Phyllophaga*) collected in Wisconsin in 1933 and 1934, 24 were found at an average depth of 15·5 inches in the soil, 237 unparasitised pupae and prepupae being taken at an average depth of 16·2 inches. The percentage of parasitism was slightly below 10. The small larvae feed externally on the ventral surfaces of the pupae of *Lachnosterna* from the middle of July and increase rapidly in size. When full-grown they hibernate in the pupal cells of their hosts. Three fully grown larvae collected on 21st April 1934 had not pupated by 1st December. One larva that became full-grown on 31st July 1933 pupated on 30th September 1934 after having been kept over winter at room temperature, and the adult emerged on 19th November.

The Bombyliids of which the life-history is known undergo a hypermetamorphosis involving a motile first larval stage. That *E. fasciata* also has such a larva appears probable in view of the depth at which its host is found.

BROUDY (H.). **Control Experiments against Fuller's Rose Beetle (***Asynonychus godmani* **Crotch) on Roses in commercial Greenhouses.**—*J. econ. Ent.* **28** no. 1 pp. 248–249. Geneva, N.Y., February 1935.

Among materials tested in Massachusetts for the control of adults of *Asynonychus godmani*, Crotch, on roses, a commercial barium fluosilicate applied as a dust apparently killed all the beetles and did not scorch the plants. Another fluorine combination and a rotenone spray were both insufficiently toxic to the beetles. The most satisfactory material against the larvae, which attack the plants beneath the ground, was a commercial carbon bisulphide emulsion sprayed on the soil. At present this treatment is probably too expensive for commercial use.

EMERY (W. T.). **Breeding the Hessian Fly and its Parasites in Shell Vials.**—*J. econ. Ent.* **28** no. 1 p. 249. Geneva, N.Y., February 1935.

Previous experience has shown that newly hatched larvae of the Hessian fly [*Mayetiola destructor*, Say] cannot be successfully transferred to a dry leaf of a tiller of wheat, but in 1932–33 eggs placed in a

watch glass of water hatched and the larvae remained active for several hours. They could be lifted from the water with a camel-hair brush and floated into a bead of water previously placed in the axil of a leaf, after which they settled on the ligule, whence they crawled down the leaf sheath, established themselves and finally pupated. In breeding parasites of the fly, adults of *Platygaster hiemalis*, Forbes, *P. herricki*, Pack., and *P. zosine*, Wlk., were introduced into a vial containing 200–300 host eggs. The parasites oviposited freely in the eggs, which remained viable for a month in refrigeration. The larvae hatch as required if placed in a dish of water at room temperature, but should be quickly removed to their food-plant. The plant to which the larvae have been transferred should be placed under a bell-jar to prevent too rapid evaporation. By this method as many as 10 larvae have been successfully matured on a single tiller.

Howard (N. F.) & Davidson (R. H.). **Effect of Heat Treatment on Toxicity of Calcium Arsenate to Bean Foliage.**—*J. econ. Ent.* **28** no. 1 p. 250. Geneva, N.Y., February 1935.

Five of the 19 samples of commercial calcium arsenates previously found to be most injurious to bean foliage [*R.A.E.*, A **21** 613] and one other were put into cloth bags and placed under 150 lb. steam pressure in an autoclave. The samples remained in the chamber for 2 hours before the steam was released gradually. The temperature in the autoclave was believed to reach 366°F. The arsenicals were then applied to bean foliage as sprays (1 lb. to 50 U.S. gals. water) at the rate of 200 gals. to the acre so as to wet the leaves thoroughly on both sides. Some plots received one, some two and some three applications, at relative humidities of 50–74 per cent. Four of the samples did not harm the foliage at all, and the other two injured 5 per cent. or less as compared with 45 to 100 per cent. from the same materials when untreated. A sample of magnesium arsenate similarly treated injured more foliage than the original material.

Kunkel (L. O.). **Recent Advances in Studies on Plant Virus Diseases.**—*Rep. Quebec Soc. Prot. Pl.* **25–26** pp. 23–33, 4 figs., 34 refs. Quebec, 1934. [Recd. April 1935.]

This paper, which briefly reviews recent work on virus diseases of plants and on their insect vectors, includes brief notes on the bionomics in the United States of *Macropsis trimaculata*, Fitch, a vector of yellows disease of peaches [*cf. R.A.E.*, A **21** 192; **22** 298].

Seamans (H. L.) & Gray (H. E.). **Design of a new Type of Light-trap to operate at controlled Intervals.**—*Rep. Quebec Soc. Prot. Pl.* **25–26** pp. 39–46, 6 figs. Quebec, 1934. [Recd. April 1935.]

Diagrams, specifications for construction, and a detailed description are given of a multiple light-trap and its auxiliary apparatus. The trap, which is intended to correlate more closely the factors of temperature and relative humidity with the flight of insects, consists of seven units, co-ordinated by means of a clock to give a continuous record.

It was constructed to get data on the flight of June beetles [*Lachnosterna*]. The units operated in turn, each for one hour. In order to correlate the activity of the insects with temperature and humidity, each unit was connected to a thermohygrograph.

GRAY (H. E.). **Some Insect Problems in Preparing and Marketing Stored Products.**—*Rep. Quebec Soc. Prot. Pl.* **25–26** pp. 47–51. Quebec, 1934. [Recd. April 1935.]

This paper is a brief survey of some insect pests of stored products in Canada, with particular reference to the flour milling and sweetmeat industries. If the temperature of stored grain has been raised [*cf. R.A.E.*, A **20** 645] by the activities of *Calandra* (*Sitophilus*) *granaria*, L., which causes severe damage in Eastern Canada, particularly in Ontario, it is usual to disturb the grain in order to reduce the temperature. Notes are given on the control of *Ephestia kühniella*, Zell., and *Tribolium confusum*, Duv., by superheating and by fumigation with hydrocyanic acid gas or with a mixture of ethylene dichloride and carbon tetrachloride. Recently, contact sprays, such as pyrethrum in an oil carrier, have been used as a means of control. *Ptinus villiger*, Reitt. [*cf.* **13** 579] may be controlled by spraying with pyrethrum as soon as the adult beetles appear and before they can oviposit.

The only satisfactory method of controlling *Plodia interpunctella*, Hb., a common pest of fruits and nuts used in the manufacture of sweetmeats [*cf.* **21** 325] is fumigation. Packages wrapped in wax paper and cellophane may be fumigated with a mixture of 1 part ethylene oxide and 9 parts carbon dioxide [*loc. cit.*]. The gas penetrates well and leaves no odour, but is expensive.

TWINN (C. R.). **Some Remarks on Fumigants.**—*Rep. Quebec Soc. Prot. Pl.* **25–26** pp. 52–57. Quebec, 1934. [Recd. April 1935.]

Brief notes are given on the more common fumigants used against household and stored products insects. Hydrocyanic acid gas is still the most practical fumigant for general uses. Methods of generating it, the quantities of materials required and the use of safety measures are very briefly discussed. A liquid mixture of 1 part ethylene oxide to 9 parts carbon dioxide [*cf. R.A.E.*, A **20** 298] penetrates better than HCN and, but for its high cost, would probably replace it. Experiments were carried out at Toronto in January 1932 to test the effectiveness of the gas under various conditions on various stages of the usual Lepidopterous and Coleopterous pests of stored products. These were exposed in containers in clothing, furniture, flour, wheat, etc., in 2 vaults each of 12,000 cu. ft. capacity. The relative humidity, which averaged 40 per cent. and the temperatures, which were varied, were recorded by thermohygrographs. A sudden fall in temperature, varying from 4 to 12°F., was observed on the release of the gas, but in the vault containing no heating unit it gradually rose again to its original level. In most cases, insects that were still living after exposure to the gas died within 24 hours. When the rate was 10 lb. or 20 lb. per 1,000 cu. ft. for 17 hours at temperatures of 66–94°F., boxes of chocolate sealed with 3 layers of waterproof cellophane were the only containers into which the gas did not penetrate in sufficient quantity to kill all the insects. Five lb. per 1,000 cu. ft. for 17 hours at 84–90°F. killed 99 per cent. of the insects, but 7 lb. for the same period at 70°F. gave unsatisfactory results. All the insects were killed by 20 lb. at temperatures of 69–73°F. in 5½ hours, but some survived fumigation for the same time with 10 lb. even at 86–95°F.

Another liquid fumigant, consisting of 3 parts by volume of ethylene dichloride and 1 part by volume of carbon tetrachloride [*cf.* **16** 86],

should prove valuable for the fumigation of grain, etc. The recommended dosage in the United States is 14 lb. per 1,000 cu. ft. for 24 hours at a temperature of 70°F. or over. In experiments carried out in October 1931 in Ontario cadelle larvae [*Tenebroides mauritanicus*, L.] and mites were exposed at various levels in a fumigating chamber in which a sealed incubator for rearing *Sitotroga* containing about 2 bushels of heavily infested grain was also placed. When the rate was 32 lb. per 1,000 cu. ft. at a temperature of 80°F. and a relative humidity of 50 per cent., all the exposed insects and mites were dead after 24 hours, but many in the incubator were still alive. A blanket soaked in the fumigant was hung in the chamber and a fan placed on the floor circulated the gas. Under similar conditions the mixture of ethylene oxide and carbon dioxide destroyed all insect life. In tests made in Toronto in January 1932 insects in clothing, upholstered furniture, etc., were exposed to the gas at the rate of 14 lb. per 1,000 cu. ft. in 2 fumigation vaults for 46 hours. The fumigant was vaporised by soaking sacks in it and suspending these across the upper part of the vaults. The temperature was 71–72°F. in one vault and 76–92° F. in the other. All the insects were destroyed. The relative humidity gradually rose 10 per cent. after the fumigant was introduced. The use of this fumigant requires more labour than the ethylene oxide and carbon dioxide mixture and it is unpleasant to apply without gas masks, but apparently has no ill effects.

Cyanogen chloride mixture is produced by dropping a mixture of sodium cyanide and sodium chlorate into dilute hydrochloric acid. The resultant gas, consisting of 1 part HCN and 2 parts cyanogen chloride, is a tear gas. It is reported to be almost as toxic as HCN and a good germicide as well as insecticide, and to be widely used in the disinfestation of ships, warehouses, factories, etc.

TESSIER (G. A.). **Forest Insects of the Gaspe Peninsula.**—*Rep. Quebec Soc. Prot. Pl.* **25–26** pp. 62–63. Quebec, 1934. [Recd. April 1935.]

A brief account is given of the bionomics and distribution of *Diprion polytomus*, Htg., on spruce in the Gaspe Peninsula since its discovery in 1930 [*cf. R.A.E.*, A **20** 590; **23** 236]. The larva eats about 70 needles, but always avoids the current year's growth. Damp cold weather in 1932 retarded development by at least 3 weeks. Defoliation renders the trees susceptible to the attacks of boring beetles.

HAMMOND (G. H.). **Crop Selection as an Aid to White Grub Control in Eastern Canada.**—*Rep. Quebec Soc. Prot. Pl.* **25–26** pp. 70–72. Quebec, 1934. [Recd. April 1935.]

The crops most susceptible to white grubs [*Lachnosterna*] in Quebec and eastern Ontario are maize, potatoes, strawberries and garden or root crops. These should not be planted in recently ploughed sod or pasture where large concentrations of white grubs are likely to be found; a population of 20 per sq. yd. is considered dangerous. In eastern Ontario during 1933, 75 per cent. of the injury done by white grubs was caused by planting susceptible crops in such land. Methods of crop rotation are discussed.

HAMMOND (G. H.). **A Study of White Grub Losses to Individual Crops under Mixed Farming Conditions.**—*Rep. Quebec Soc. Prot. Pl.* **25–26** pp. 72–74. Quebec, 1934. [Recd. April 1935.]

A survey of the injury caused by white grubs [*Lachnosterna*] during the severe outbreak in 1933 in eastern Ontario and the Ottawa valley, Quebec, was made over a strip of country 125 miles long in eastern Ontario. Injury to timothy grass [*Phleum pratense*] by the first instar larvae was very severe. It began in July 1932, but was not usually apparent until late August or September. With most annual crops all the injury occurred in 1933. Maximum injury took place after the third moult, which occurs in the first week of July. There was a 40–60 per cent. loss of yield in cereal crops, which are not usually injured by second year grubs, and of 50–75 per cent. in fodder maize where it had been planted on sod 2 or more years old. Potatoes were often so badly damaged when planted in timothy sod of the previous year without special soil preparation that the production for the year was less than the seed. The planting of strawberries and maize in similar land was followed frequently by partial or total loss of the crop.

GORHAM (R. P.). **Control of the Carrot Rust Fly,** *Psila rosae* **Fab.**—*Rep. Quebec Soc. Prot. Pl.* **25–26** pp. 90–96, 18 refs. Quebec, 1934. [Recd. April 1935.]

In eastern Canada, *Psila rosae*, F. [*cf. R.A.E.*, A **17** 725] occurs in cycles of three successive years of abundance followed by two years of lesser abundance. Records over 6 years in New Brunswick show that the earliest date of emergence from overwintering puparia is 25th May and the latest 9th June. In 3 days one female may deposit more than 100 eggs, which hatch in 6–10 days. The pupal stage lasts about 3 weeks, and flies of the summer generation occur from about mid-August until the end of September. Most larvae of the winter generation pupate before the end of September, but some may be carried into storage with carrots or parsnips pulled up in October.

Late planting so that the seedlings will not be above ground until the second week in June and thus escape attack by the first generation is the most effective method of control. No infestation of wild plants in New Brunswick has been observed. The early removal and destruction of injured carrots in spring helps to keep down the second generation. Carrots sown early in May can be protected from injury by this generation by harvesting during the first two weeks in September [*cf.* **19** 435]. Early carrots can be protected by muslin screens during the period of fly activity, or by treatment with insecticides during the period of egg deposition (1st–12th June), or enough seed may be planted to ensure a crop after thinning out injured roots. In four years' experiments the most effective insecticides were a solution of mercury bichloride applied at the rate of 15 lb. per acre, and derris powder at the same rate. They reduced the injury caused by the first generation to averages of 0·64 and 2·2 per cent. respectively as compared with 34·3 per cent. on untreated plots. In 1928 plots treated with mercury bichloride on 5th June, when oviposition was in progress, gave perfect crops. Those treated on 12th June, when hatching was taking place, showed 2·4 per cent. injury and those treated on 16th June showed 17 per cent., as compared with 52 per cent. in the check plots. Naphthalene reduced injury to about 15 per cent., but whether this is due to its repellent

action or to direct contact with the larvae is still undecided. In experiments with baits, 100 traps operated in June 1930 were almost entirely ineffective.

Dunn (M. B.). **A brief Account of Sampling Methods used in Population Studies of the Jack Pine Sawfly,** *Neodiprion swainei* **Midd'tn.**—*Rep. Quebec Soc. Prot. Pl.* **25–26** pp. 96–100. Quebec, 1934. [Recd. April 1935.]

During 1924–26 a severe outbreak of *Diprion* (*Neodiprion*) *swainei*, Middleton, killed large numbers of Jack pines [*Pinus banksiana*] over an area 20 miles square in north-western Quebec. Its intensity has diminished steadily, and it is now no longer dangerous. The adults appear at the end of June and lay their eggs singly in slits cut in the edges of young needles. The eggs hatch in 15–20 days. The larvae migrate to the old needles and feed in groups of from 10 to 60. When they are abundant all the old foliage may be eaten. During September and early October, the fully grown larvae drop to the ground, where they construct cocoons in the moss or under leaves and rubbish.

In 1931 the population was estimated by counting the overwintering cocoons in 4 sample plots in areas showing average infestation. The total numbers of cocoons per acre and per square mile were estimated on these figures, and the results are shown in tables. Many were destroyed by predators and parasites. By combining these results with those obtained from egg and larval studies made in the same season, another table is made giving the insect mortality from egg to adult. The average number of adult sawflies developing from an average cluster of 60·3 eggs was 1·31.

Manson (G. F.). **A preliminary Report on the Effect of Rainfall on Emergence of the Wheat Stem Sawfly** (*Cephus cinctus* **Nort.**).—*Rep. Quebec Soc. Prot. Pl.* **25–26** pp. 101–106, 2 figs., 3 refs. Quebec, 1934. [Recd. April 1935.]

In Alberta the larva of *Cephus cinctus*, Nort., feeds in a stem of wheat or grasses and descends to the level of the soil when the stem begins to ripen. It makes a cut round the inside of the stem that almost severs it and then plugs the exposed end of the stub with frass. Graphs of records of rainfall, adults caught in the field and stubs from which adults had emerged, suggest that there is a relation between rainfall and emergence. The peak of flight usually takes place 2–4 days after the heaviest rainfall recorded. The rain softens the plug through which the adult must cut to emerge from the stem. In laboratory tests water entered the stubs slowly, and the interval of 2–4 days before the effect of the rain becomes noticeable in the increased numbers of adults is probably to be explained by this. In 1930 the increased flight was not very noticeable after 0·21 in. rain on 12th June and 0·23 in. on 15th, but in 1929, 0·33 ins. on 21st June and 0·31 on 27th June were followed by a marked increase in emergence.

Maxwell (C. W. B.). **Some Feeding Experiments of the Green-house Leaf-tier** *Phlyctaenia rubigalis* **Guenée in Relation to Temperature and Humidity.**—*Rep. Quebec Soc. Prot. Pl.* **25–26** pp. 106–110, 15 refs. Quebec, 1934. [Recd. April 1935.]

In experiments in New Brunswick on the effect of temperature and humidity on the amount of food eaten by the larvae of *Phlyctaenia*

rubigalis, Gn., the larvae were reared from hatching to maturity on chrysanthemum leaves. They were divided into two lots, of which lot 1 were reared at a lower temperature and humidity than lot 2. The average larval period of lot 1 was 22·26 days and the average total amount of feeding was 30·83 sq. cm. of leaf. The corresponding figures for lot 2 were 21 days and 24·39 sq. cm. The mean temperatures were 69·3 and 73·5°F., and the mean humidities 39·5 and 91·8 per cent. for lots 1 and 2 respectively. All the larvae in lot 1 matured to adults, but in lot 2 two larvae died in their second and third instars, respectively, and a few days after death a fungus appeared on them. In Filinger's experiments [*R.A.E.*, A **19** 340], the greatest emergence of moths was 46 per cent. at 68°F. after a larval period of 22 days. This temperature and those of the above experiments thus appear to be in the optimum range. The evidence indicates that the rapidity with which food is eaten depends upon the moisture requirement of the developing insect and upon the moisture content of the food. In low humidities the moisture requirement is above the normal, development is delayed and consequently more food is eaten. Measurements of head capsules of the four instars are given in tables.

SEAMANS (H. L.) & SALT (R. W.). **Some Experiments on Temperature and Moisture and their Effect on Disease of Red-backed Cutworm (*Euxoa ochrogaster* Gn.).**—*Rep. Quebec Soc. Prot. Pl.* **25–26** pp. 118–124, 4 refs. Quebec, 1934. [Recd. April 1935.]

In 1931, experiments were undertaken in Alberta to find what effects temperature and moisture might have on disease of the red-backed cutworm, *Euxoa ochrogaster*, Gn. [*cf. R.A.E.*, A **16** 640]. Of third and fourth instar larvae collected individually [*cf.* **16** 266], some were kept isolated, while others were put in groups of 10 and 15 in one-pint jars with one inch of soil. Another collection of 200 larvae, made in the ordinary way, was placed in a two-quart container about half full of soil. Some larvae were kept in moist, others in wet soil, and some of each of these two classes were kept at a constant temperature of 13°C. [55·4°F], while others were kept at 21°C. [69·8°F.]. These temperatures represented the maximum and mean for May and June when the cutworms are normally active. Disease was slightly more prevalent at the lower temperature, fewer parasites emerged, more pupae died and more cannibalism took place. At both temperatures mortality from disease was less among isolated larvae than among larvae kept in groups. When 100 larvae kept in individual boxes from the time they were collected were divided into lots of 50 and reared at each of the two temperatures, the soil being kept at approximately the same moisture, the same number in each series died of disease. At the lower temperature, less parasites and less moths emerged. Of larvae kept in soil that was wet enough to cohere, 68·8 per cent. died of disease, as compared with 40 per cent. of those kept in soil just moist enough for plants to grow well. Excessive moisture may be a more important factor than temperature in producing disease. It is also probable that either the parasites are affected by moisture, or parasitised cutworms are more susceptible to disease when the moisture is excessive. In moist soil parasites emerged from 30 per cent. of the larvae as compared with 14·6 in wet soil. When larvae were kept at the two temperatures in wet and moist soil, disease was most prevalent

among those in wet soil at 55·4°F., a result that agrees with observations in nature. Larvae collected individually were grouped in lots of 10 and 15 in one-pint jars with a soil surface area of about 9 sq. ins. at the higher and lower temperatures and in moist and wet soil. Under each condition the percentage mortality from disease was higher in the group of 15 larvae. The numbers of cutworms were very small and they were probably more crowded than in nature, but the increase of disease with greater crowding may explain why severe outbreaks are sometimes terminated in the field by disease, whereas outbreaks with fewer numbers of cutworms appear to be affected very little.

Finally, moths emerged only from isolated larvae, so that crowding possibly has some effect. Of larvae kept under ideal moisture conditions, 44 per cent. produced moths at 69·8°F. and 20 per cent. at 55·4°F. In all cases the moths were fully formed within the pupae, but in two kept at the lower temperature the bodies of the moths were full of mould, although there were no other signs of a disease among the pupae.

MARSHALL (J.). **Recent Developments in Orchard Spray Practices.**—*Rep. Quebec Soc. Prot. Pl.* **25–26** pp. 125–134, 17 refs. Quebec, 1934. [Recd. April 1935.]

This is a review of the literature on the use of sprays to control orchard pests in the north-western United States, with particular reference to the codling moth [*Cydia pomonella*, L.]. The author demonstrated that the addition of 5 per cent. oleic acid to mineral oil, and the subsequent emulsification of this with a dilute solution of sodium silicate produced an oil emulsion that was effective when used with lead arsenate for codling moth control. A variety of factors, including the non-drying nature of oleic acid, the production of a film type of coverage, heavy deposit, ovicidal effect and possible repellence to moths, may interact to produce the high effectiveness of this mixture. It is, however, possible that residue removal may prove difficult.

BARNES (H. F.). **Lavender Pests.**—*J. R. hort. Soc.* **60** pt. 3 pp. 113–118, 3 pls. London, March 1935.

Brief notes are given on the larvae of several polyphagous species of moths that were found feeding on a lavender hedge in Hertfordshire during 1932–34.

SILVESTRI (F.). **Le cocciniglie degli agrumi in Italia.** [The Coccids of *Citrus* in Italy.]—*Atti I Congr. agrum. Palermo 1933* pp. 123–133. Rome, 1935.

Brief notes are given on the bionomics and distribution of the Coccids that attack *Citrus* in Italy and on the measures employed for their control in various parts of the world. The species involved are *Icerya purchasi*, Mask., *Pseudococcus citri*, Risso, *Ceroplastes sinensis*, Del G., *Coccus hesperidum*, L., *Saissetia oleae*, Bern., *Lepidosaphes pinnaeformis*, Bch., *Aspidiotus hederae*, Vall., *Parlatoria zizyphus*, Lucas, *Parlatoria pergandei* var. *camelliae*, Comst., *Aonidiella aurantii*, Mask., and *Chrysomphalus dictyospermi*, Morg.

BERLAND (L.). **Premiers résultats de mes recherches en avion sur la faune et la flore atmosphériques.**—*Ann. Soc. ent. Fr.* **104** pt. 1 pp. 73–96, 1 pl., 6 figs., 5 refs. Paris, 31st March 1935.

In order to obtain samples of the insects flying at heights varying between 3,000 and 7,000 feet, a net shaped like a truncated cone was attached by a cord to the wing of an aeroplane at a distance of about 10 ft. from the fuselage. A second cord by which the net was controlled led to the window in the door. The technique and the methods employed are described in detail, and a list of the species caught is given.

BENZ (P.). **Standardisierung der Schädlingsbekämpfungsmittel ?** [Standardisation of Insecticides and Fungicides ?]—*Landw. Jb. Schweiz* **49** no. 2 pp. 204–220, 10 figs., 4 refs. Bern, 1935. (With a Summary in French.)

The constantly increasing number of commercial insecticides and fungicides has created a demand for their standardisation. The author has studied this question with a view to establishing a series of effective preparations, so that makers may manufacture products standardised to a given type instead of marketing materials of diverse composition. He examines tar distillates with respect to chemical composition, physical properties, insecticidal value, spray technique and economic requirements, and concludes that it is at present impossible to indicate a standard type for a tar distillate intended for orchard use [*cf. R.A.E.*, A **13** 586]. There is the initial difficulty of securing a coal-tar of constantly uniform composition, and the tar-oils derived from it are also exceedingly variable. The standards laid down by Houben in 1929 [**18** 183] no longer correspond to requirements, and he intends to publish new standards. The author suggests that an orchard tar distillate should contain at least 75 per cent. tar-oil, not more than 15 per cent. acid oils (phenols) and not more than 5 per cent. basic oils. Not more than 10 per cent. of the tar-oil should distil at 200°C. and less than 50 per cent. at 250°C. It is further suggested that an orchard tar distillate should be sufficiently effective in practice at a concentration of 5 per cent.

FÁRI (L.) & FÁRI (Mme. L.). **Die Giftwirkung von Arsenverbindungen auf den Rübenrüssler.** [The poisonous Effect of arsenical Preparations on Beet Weevils.] [*In Magyar.*]—*Mezögazdas. kutatás.* **5** pp. 455–462, 2 figs., 13 refs. Budapest, 1932. (With a Summary in German.) [Recd. April 1935.]

Since the resistance to barium chloride of weevils of the genus *Cleonus*, which annually cause severe damage to beet in Hungary, seems to have increased after the use of this insecticide for many years, laboratory tests were carried out to determine the relative toxicity of a number of arsenicals. The sandwich method [*R.A.E.*, A **18** 311] was adopted, and the results are shown in tables. Former observations that the toxicity of an arsenical depends on its fineness and solubility as well as its arsenic content were confirmed. A proprietary calcium arsenate preparation proved to be 13 times as effective as barium chloride. The figures obtained by the sandwich method were checked by analysis of the weevils.

FÁRI (L.) & FÁRI (Mme. L.). **On the Treatment of Fruit Trees with Carbolineum and on the Control of the San José Scale.** [*In Magyar.*] —*Mezõgazdas. kutatás.* **7** pp. 78–102, 70 refs. Budapest, 1934. (With a Summary in English.) [Recd. April 1935.]

Tabulated results are given of experiments in Hungary in which sprays made of various commercial brands of tar distillate were applied in November–December 1932 or February–March 1933 to young apple and cherry trees heavily infested with the San José scale [*Aspidiotus perniciosus*, Comst.]. It was found that to be wholly effective, the emulsion had to contain 15 per cent. tar distillate if the coal-tar oils of which it was composed boiled at under 200°C., or 10 per cent. if they boiled at above 200°C.

[DIRSH (V.).] **Дирш (В.) Schädlinge der kautschukerzeugenden Pflanzen in der Ukraine.** [Pests of Rubber-producing Plants in the Ukraine.] [*In Ukrainian.*]—*J. Cycle biozool. Acad. Sci. Ukr.* no. 4 (8) pp. 41–58, 12 figs., 1 graph. Kiev, 1933. [Recd. April 1935.]

A list is given of pests of rubber-producing plants observed in 1930–33 in various parts of the Ukraine, showing their food-plants, local distribution and importance. Brief notes on the bionomics of the more injurious species are included. Of the 70 insects recorded, the majority occurred on introduced plants, *viz.*: *Taraxacum* sp., *T. gymnantum*, *Asclepias cornuti*, and especially *Scorzonera tau-saghiz*, which produces more rubber than any of the others.

The chief of these pests were: *Calliptamus siculus*, Burm., which attacked *Scorzonera*; *Aphis fabae*, Scop., on *Scorzonera* and *Asclepias*; *A. gossypii*, Glov., on *Asclepias*; and larvae of *Pentodon idiota*, Hbst., *Melolontha melolontha*, L., *Amphimallus solstitialis*, L., and *Anisoplia segetum*, Hbst., on the roots of *Scorzonera* and *Taraxacum* spp. The flowers of *Taraxacum* and *Scorzonera* were injured by *Ensina sonchi*, L., *Paroxyna tessellata*, Lw., and the adults of *Epicometis hirta*, Poda, and those of *Taraxacum* only by *Ceuthorrhynchus punctiger*, Gyll. The eggs of *E. sonchi* are laid in the buds, and the larvae feed on the ovary of the flowers or on young seeds. The larval stage lasts 5–9 days and the pupal 6–8. In 1932 all plants of *T. gymnatum* near Kiev were infested by the end of August and again reinfested at the beginning of September by the newly emerged flies. They also breed to a less extent on a number of other Compositae. The larvae of *P. tessellata* attack the flowers from mid-July to mid-September and cause similar injury. Each flower harbours 1–5 larvae, and the pupal stage lasts 6–11 days.

Chondrilla juncea, which is indigenous to the Ukraine, was attacked by *Myzus* (*Myzodes*) *persicae*, Sulz., which only occurred in greenhouses, also causing damage to *Asclepias* and especially to *S. tau-saghiz*, *Mylabris quadripunctata*, L., and *M. decempunctata*, F., which injured the flowers, and *Opatrum sabulosum*, L., *P. idiota*, *M. melolontha* and the Pyralid, *Bradyrrhoa gilveolella*, Tr., all of which attacked the roots, causing exudation of latex [but *cf. R.A.E.*, A **19** 227]. The Pyralid probably had no more than three generations a year, the larvae of the last hibernating in the soil and pupating in spring. The young adults appear in May, and those of the first and second generations about the end of June and in August respectively. The moths live about 15 days.

The eggs are laid in the soil or on the plants in batches of 10–200. The young larvae, 1–25 of which occur on a single plant, gnaw the roots and feed on the exuding latex. They are protected by cases of frass. Cases harbouring mature larvae are from 1½ to 4 ins. long and weigh, together with the adhering particles of soil, from 0·4 to 1·5 gm. As they are attached to the roots in the soil, the plants are destroyed when they are removed, so that they have no economic importance in connection with the extraction of rubber contained in them. In 1931, about 6 per cent. of the larvae were parasitised by Chalcids and Ichneumonids, and some were killed by fungous diseases.

[Borkhsenius (N. S.).] **Борхсениус (Н. С.). Survey of the Coccid Fauna of the Eastern Coast of the Black Sea.** [*In Russian.*]—Demy 8vo, 37 pp., 2 refs. Sukhum, Abkhazsk. karant. Punkt [Quarant. Sta. Abkhazia], 1934. [Recd. April 1935.]

As result of investigations on the Black Sea coast of Transcaucasia in 1931, notes are given on the Coccids found there, showing their local distribution and food-plants and the parts of the plants they attack. The more important species, notes on the bionomics of which are given, comprised *Icerya purchasi*, Mask., *Pseudococcus adonidum*, L., *P. gahani*, Green, *Pulvinaria aurantii*, Ckll., *Ceroplastes sinensis*, Del G., *Coccus pseudomagnoliarum*, Kuw., *Lepidosaphes gloveri*, Pack., *Chrysomphalus dictyospermi*, Morg., and *Aonidiella aurantii*, Mask., all of which were serious pests of *Citrus*, and *Diaspis boisduvali*, Sign., on palms. The other Coccids found included two undescribed species, the proposed names of which are given, one belonging to an undescribed genus.

A list of the food-plants shows the Coccids found on each.

Murayama (J.). **Expériences sur l'emploi des insecticides contre les deux Chrysomélides : *Agelastica coerulea* Baly et *Melasoma adamsi* Baly. I.** [*In Japanese.*]—pp. 1–39, 12 refs. Keijo, For. Exp. Sta., 1934. (With a Summary in French.) [Recd. April 1935.]

The Galerucid, *Agelastica coerulea*, Baly, and the Chrysomelid, *Melasoma adamsi*, Baly, cause serious injury to alders planted on mountains in Korea. In experiments with 28 insecticides, products of derris and a kerosene emulsion gave the most satisfactory results in the laboratory and were about equally effective in the field, one of the derris-soap sprays being the best. The addition of pyrethrum to the kerosene emulsion gave unsatisfactory results. *Agelastica* was less resistant to the insecticides than *Melasoma*.

Murayama (J.). **Rapport sur les moyens répressifs employés contre les hannetons. II. Expériences sur la variété des lumières de lanterne dans l'attraction du *Holotrichia diomphalia* Bates. I.** [*In Japanese.*]—pp. 42–85, 8 fldg pls., 2 pp. refs. Keijo, For. Exp. Sta., 1934. (With a Summary in French.) [Recd. April 1935.]

Lachnosterna (*Holotrichia*) *diomphalia*, Bates, is a serious pest of forests and crops throughout Korea. Flights of adults occur every other year and take place each night throughout the period of emergence, except when it rains. Experiments were carried out in 1933

with different coloured lights arranged under a specially constructed apparatus. Many females were attracted by green light and oviposited. Brown and yellow were also attractive to females and white to males. Violet had no effect. Combinations of green and brown together with yellow or white are therefore recommended for light-traps.

ROEPKE (W.). **De slakrupsenplaag op het Molukken-eiland Batjan.** [The Limacodid Pest on the Island of Batjan, Moluccas.]—*Meded. Landb.Hoogesch. Wageningen* **39** no. 1, 40 pp., 1 fig., 5 pls., 30 refs. Wageningen, 1935. (With a Summary in German.)

This is an account of observations in July and August 1929 in an 800-acre coconut plantation in the island of Batjan, Moluccas, during a serious infestation, dating from 1926, by the Limacodids, *Chalcocelis albiguttata*, Snell., and *Thosea moluccana*, sp. n. The latter was the more injurious. All stages of both species are described. Records of infestations by Limacodids in the Netherlands Indies and elsewhere are noticed.

Females of *C. albiguttata* each laid 500–600 eggs within a few nights. Oviposition by *T. moluccana* was not observed. The two species appeared to develop in a similar manner. The egg stage lasted about 4 days, and the pupal about 25. In nature the average duration of a generation should be about 3 months. The larvae were attacked by diseases (of which the chief appeared to be due to a fungus). The Chalcid, *Brachymeria euploeae*, Westw., was the only parasite of *C. albiguttata* observed, and it destroyed only a small percentage of the pupae. *T. moluccana* had two parasites. The Braconid, *Apanteles thoseae*, sp. n. (here described) parasitised the newly hatched larvae, and pupated after leaving its nearly mature hosts, which afterwards died. The Tachinid, *Phorocera magna*, sp. n., which Baranoff describes in a supplementary note, probably lays its eggs on the plant near the host larva. It pupates in the cocoon of the host. Each of these two species parasitised about 10 per cent. of the larvae. The Tachinid was released from cages in which cocoons of *T. moluccana* had been placed.

The control measures tried were collecting the pupae and spraying with lead arsenate, which, however, failed to wet the coconut leaves uniformly, so that the larvae fed on the uncovered parts. Two Tachinids, *Ptychomyia remota*, Aldr., and *Degeeria albiceps*, Macq., were introduced [from Java] and released in Batjan, but it is not known whether they established themselves.

PEMBERTON (C. E.). **Entomology.**—*Rep. Comm. Exp. Sta. Hawaii. Sug. Pl. Ass. 1934* pp. 19–26. Honolulu, 1935.

This report deals with work on sugar-cane pests in Hawaii in the year ending 31st August 1934. The distribution of *Anomala orientalis*, Waterh., was about the same as in the preceding year [*cf. R.A.E.*, A **22** 137]. Both the predatory wireworm, *Pyrophorus* sp. and *Elis* sp., near *E. pulchrina*, Cam., which was the most numerous of the 7 parasites introduced from Guatemala [**23** 219], also attack the larvae of *Adoretus sinicus*, Burm. Laboratory tests indicated that the wireworm will not attack any part of the cane setts. Scoliid larvae observed on *Anomala* in August may be those of *Tiphia segregata*, Cwfd., which has

not been recovered since its introduction from the Philippines in 1917 [**6** 275]. The mortality of *Anomala* that results from ploughing the land and leaving it fallow appears to be chiefly due to the drying out of the soil through cultivation and exposure to sunlight. When frequent rains occur during the fallow period, the mortality is reduced. The eggs and young larvae are killed by exposure to air with a moisture content slightly below saturation point. Soils that are favourable to *Anomala* apparently dry into light, fluffy masses free from clods and cracks in which the subsoil is protected from drying. Experiments showed that larvae can develop in unfavourable soil if moisture is added frequently. White arsenic applied to the soil [*cf.* **23** 219] does not appear to affect, or be taken up by, the cane plants.

Varieties of cane with hard rind appear able to resist attack by *Rhabdocnemis obscura*, Boisd. Parasitism of the larvae of *Spodoptera mauritia*, Boisd., and *Cirphis unipuncta*, Haw., averaged 40 and 50 per cent. in 3 and 12 collections, respectively, but the disappearance of large outbreaks is sometimes too rapid to be due to parasites. No difference has been observed between sugar-cane plants artificially infested with pineapple mealybug [*Pseudococcus brevipes*, Ckll.] and healthy ones nor have symptoms of disease or depressed growth been noticed [*cf.* **22** 137].

A further 5,045 individuals of the Malayan parasite [*Scelio pembertoni*, Timb.] were distributed against the Chinese grasshopper [*Oxya chinensis*, Thnb.], and it is now established on all the main islands except one. It is not yet an effective check in all localities. In the laboratory the grasshopper was killed readily by the standard army-worm poison dusts [*cf.* **21** 16, 347].

Metzger (F. W.), van der Meulen (P. A.) & Mell (C. W.). **The Relation of the Sugar Content and Odor of clarified Extracts of Plants to their Susceptibility to attack by the Japanese Beetle.**—*J. agric. Res.* **49** no. 11 pp. 1001–1008, 1 fig. Washington, D.C., 1st December 1934. [Recd. April 1935.]

The following is chiefly based on the authors' summary: Clarified extracts (mostly from the leaves) were made from 97 species and varieties of plants, which were divided into four categories according to their recognised susceptibility to attack by *Popillia japonica*, Newm., in the United States. The odour as well as the sugar content appear to be significant factors in their attraction to the beetles. Of the plants having clarified extracts characterised by a fruity odour, 70·9 per cent. of those with a reducing-sugar content varying between 15 and 30 mg. per gram of plant material and 46·7 per cent. of those with a sugar content under 15 mg. were badly infested. Of plants having extracts without the fruity odour the corresponding percentages were 21·5 and 18·2. It appears unlikely that a plant will be heavily attacked if the reducing-sugar content is less than 15 mg. per gram plant material and the clarified extract is not characterised by a fruity odour.

Bailey (J. S.) & Franklin (H. J.). **Blueberry Culture in Massachusetts.**—*Bull. Mass. agric. Exp. Sta.* no. 317, 19 pp., 8 figs., 9 refs. Amherst, Mass., February 1935.

In the course of this paper notes are given on the feeding habits and control of the insects that sometimes attack blueberry (*Vaccinium*

corymbosum) in Massachusetts, *viz.*, *Anthonomus musculus*, Say [*cf. R.A.E.*, A **15** 84], *Oberea myops*, Hald. [**18** 280], *Gelechia trialbamaculella*, Cham. [**14** 67], *Porthetria dispar*, L., and *Schizura concinna*, S. & A., both of which may be controlled by lead arsenate sprays, *Clastoptera proteus* var. *saint-cyri*, Prov., against which a spray of $1\frac{1}{3}$ U.S. qts. nicotine sulphate, 4 lb. fish-oil soap and 100 U.S. gals. water is recommended, and *Mineola vaccinii*, Riley, for which no control is yet known. *Lachnosterna* (*Phyllophaga*) sp. may damage newly set plants, especially in meadow land, but the injury may be greatly reduced by keeping the land fallow or growing a cultivated crop for a year before the blueberry plants are set out.

Papers noticed by Title only.

Blackman (M. W.). **A Revisional Study of the Genus *Scolytus* Geoffroy (*Eccoptogaster* Herbst) in North America** [including nine new species from conifers in U.S.A.].—*Tech. Bull. U.S. Dep. Agric.* no. 431, 30 pp., 44 refs. Washington, D.C., September 1934. [Recd. April 1935.]

Balachowsky (A.). **Cochenilles nouvelles et peu connues du Maroc.**—*C. R. Ass. franç. Av. Sci.* **58** pp. 160–163, 1 fig., 2 refs. Paris, 1934.

Hille Ris Lambers (D.). **New Central European Aphididae** [including 1 new genus and 3 new species from Germany and 1 new species from Germany and Holland].—*Arb. morph. taxon. Ent. Berl.* **2** no. 1 pp. 52–55. Berlin, April 1935.

Hempel (A.). **Three new Species of Coccidae (Hemiptera-Homoptera) including three new Genera and one new Sub-Family from Brazil.**—*Arb. morph. taxon. Ent. Berl.* **2** no. 1 pp. 56–62, 4 figs. Berlin, April 1935. [Translation of previous paper, *R.A.E.*, A **22** 503.]

Hall (W. J.). **Observations on the Coccidae of Southern Rhodesia. VI.** [Including 6 new species.]—*Stylops* **4** pt. 4 pp. 73–84, 7 figs. London, 15th April 1935. [*Cf. R.A.E.*, A **19** 560; **20** 592.]

Takahashi (R.). **Three new Aphids of the Genus *Thoracaphis*, van der Goot (Hem.).**—*Stylops* **4** pt. 4 pp. 86–89, 1 fig. London, 15th April 1935.

Tissot (A. N.). **A new *Myzus* [*M. eriobotryae*] from Florida.**—*Florida Ent.* **18** no. 4 pp. 49–52, 1 fig. Gainesville, Fla, March 1935.

van der Meer Mohr (J. C.). **Verzeichnis der bis jetzt von Sumatra bekannten Blattlaus-Arten.** [A List of the Aphids hitherto recorded from Sumatra.]—*Misc. zool. sumatra.* **90** 7 pp., 10 refs. Medan, February 1935.

Takahashi (R.). **Some new Species of Aphididae from Sumatra.**—*Misc. zool. sumatra.* **91** 9 pp., 3 figs. Medan, April 1935.

Sim (R. J.). **Characters useful in distinguishing Larvae of *Popillia japonica* and other Introduced Scarabaeidae from Native Species.**—*Circ. U.S. Dep. Agric.* no. 334, 20 pp., 8 figs., 1 ref. Washington, D.C., December 1934. [Recd. April 1935.]

McDOUGALL (W. A.). **The Determination of Larval Instars and Stadia of some Wireworms (Elateridae).**—*Ent. Bull. Div. Ent. Sug. Exp. Sta. Qd* no. 21, 28 pp., 3 pls., 2 figs., 18 refs. Brisbane, September 1934. [Recd. May 1935.] [See *R.A.E.*, A **22** 623.]

McDOUGALL (W. A.). **The Wireworm Pest** [*Lacon variabilis*, Cand.] **and its Control in central Queensland Sugar-cane Fields.**—*Ent. Bull. Div. Ent. Sug. Exp. Sta. Qd* no. 22, 37 pp., 27 figs., 23 refs. Brisbane, January 1935. [See *R.A.E.*, A **23** 202.]

MURAYAMA (J.). **On the Ipidae (Coleoptera) from Formosa with special References to their Food Plants.**—*J. Soc. trop. Agric.* **6** no. 3 pp. 505–512. Taihoku, November 1934. [Recd. April 1935.]

QUAYLE (H. J.). **Effect of Temperature and Humidity on Fumigation for Red Scale** [*Aonidiella aurantii*, Mask., on lemon in California]. —*Calif. Citrogr.* **19** no. 10 p. 264. (Abstr. in *Exp. Sta. Rec.* **72** no. 2 pp. 225–226. Washington, D.C., February 1935.) [*Cf. R.A.E.*, A **23** 38].

BRIMBLECOMBE (A. R.). **Queensland Pine Beetle** [*Calymmaderus incisus*, Lea].—*Pamphl. Dep. Agric. Qd* no. 20, 12 pp., 3 pls., 9 refs. Brisbane, 1934. [Recd. April 1935.] [See *R.A.E.*, A **23** 201.]

VEITCH (R.). **Queensland Fruit Fly** [*Dacus ferrugineus*, F.] **Control.**—*Adv. Leafl. Dep. Agric. Qd* no. 15, 2 pp. Brisbane, 1934. [Recd. April 1935.] [See *R.A.E.*, A **23** 202.]

DE BUSSY (L. P.), VAN DER LAAN (P. A.) & JACOBI (E. F.). **Resultaten van Proeven met Derrispoeder en Rotenon op Nederlandsche Insecten.** [Results of Tests with Derris Powder and Rotenone on Netherlands Insects.]—*Ber. HandMus. kolon. Inst. Amst.* no. 91, 25 pp. 2 figs., 11 refs. Amsterdam, 1935. (Repr. from *De Indische Mercuur*, February 1935.) [*Cf. R.A.E.*, A **23** 256.]

KEMPER (H.). **Aus der neueren Literatur über gasförmige Mittel zur Raumentwesung.** [From the recent Literature on Fumigants for Disinfestation of Buildings (an annotated list of papers).]—*Z. GesundhTech. Städtehyg.* **27** no. 2–3 pp. 67–72. Berlin, 1935.

DONER (M. H.). **The Anatomy of the Reproductive System of** *Coleophora pruniella* **Cl.**—*Canad. Ent.* **67** no. 3 pp. 52–55, 2 figs., 4 refs. Orillia, March 1935.

BRITTAIN (W. H.). **The Role of Insects in Apple Pollination** [in Nova Scotia].—*Rep. Quebec Soc. Prot. Pl.* **25–26** pp. 34–37. Quebec, 1934. [Recd. April 1935.] [*Cf. R.A.E.*, A **22** 35.]

JOHNSON (J.) & HOGGAN (I. A.). **A descriptive Key for Plant Viruses** [divided into those transmissible by Sucking Insects and those not so transmissible].—*Phytopathology* **25** no. 3 pp. 328–343, 9 refs. Lancaster, Pa, March 1935.

ROARK (R. C.). **Review of United States Patents relating to Pest Control** [issued January 1933–December 1934].—**6** nos. 1–12; **7** nos. 1–12. Washington, D.C., U.S. Dep. Agric., Bur. Chem. & Soils, 1933–34.

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